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Outcomes of an Emotion Word Intervention for Children
with Social Communication Impairments

Rebecca C. Mansfield

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

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ABSTRACT

Outcomes of an Emotion Word Intervention for Children with Social Communication Impairments

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Master of Science

Children with social communication disorders have been found to exhibit deficits in emotional intelligence, including the ability to identify emotions attributed to facial expressions. The purpose of this thesis was to examine the efficacy of a social communication intervention program designed to increase the accuracy of emotion based word use in three elementary school-aged participants with social communication disorders. The participants took part in a multiple-baseline, 20-session treatment including story enactment, journaling procedures, and supplementary activities. The story enactment portion of the intervention centered on Mercer Mayer's *A Boy, A Dog, and A Frog* (1967) wordless picture book series. Participants' emotion word productions were analyzed in six categories (*happiness, sadness, anger, fear, surprise, and disgust*) and valence accuracy was determined for all productions. Results proved variable, but each of the three participants demonstrated improvements in accuracy in at least two emotion categories that were not mastered prior to the onset of the intervention. In addition, two of the three participants increased in valence accuracy of emotion word productions between baseline and follow-up measures. Taken as a whole, the results suggest that this particular intervention program was effective in improving competency in select emotion categories for all three participants. Discussions of individual participant outcomes are included, as well as suggestions for further research.

Keywords: social communication impairment, school-age children, emotional intelligence, social competence, social communication intervention, emotion expression, emotion based words

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Introduction

Social communication is defined as “the intersection of language and social behaviors observed during peer interactions...that is, the verbal and nonverbal behaviors children display as they approach peers, maintain conversations, and resolve conflicts during peer interactions” (Timler, Olswang, & Coggins, 2005, p. 171). Although the language system is in itself complex, the ability to use that system to achieve social goals encompasses an even wider range of necessary skills. Social communication requires the coordination of social interaction, pragmatics, social cognition, and language processing (Adams, 2005).

Social communication poses a challenge for children with a variety of impairments (Adams, 2005). These problems also characterize a unique category of impairment, *social (pragmatic) communication disorder* (American Psychiatric Association, 2013). Social communication problems are closely associated with the diagnostic category of autism (Adolphs, 2001; Boraston, Blakemore, Chilvers, & Skuse, 2007; Hadjikhani, Joseph, Snyder, & Tager-Flusberg, 2006). Difficulties in social development and social interaction are a defining characteristic of autism with both the range and severity of social difficulty being key components to the diagnosis of this disorder (American Psychiatric Association, 2013). Impairments in social interaction are typically manifested early in development and persist into adulthood (McGovern & Sigman, 2005).

Children with language impairment (LI) have been found to exhibit deficits in social communication. These children have been noted to exhibit a range of interactional deficits, although these deficits may not be as pervasive as those observed in children with autism spectrum disorders (ASD; see Brinton & Fujiki, 2012, for review). By way of example, researchers have found that children with LI have significant difficulties entering the on-going

interactions of peers (Brinton, Fujiki, Spencer, & Robinson, 1997; Liiva & Cleave, 2005), are often nonresponsive to conversational bids from others (Bishop, Chan, Adams, Hartley, & Weir, 2000; Hadley & Rice, 1991), and have difficulty making related comments to a topic introduced by another speaker (Brinton, Fujiki, & Powell, 1997). All of these behaviors require strong social communication skills.

According to some researchers, the dimensions of structural language and social communication could reasonably share some common neurophysiological mechanisms, creating an overlap between aspects of the disorders of ASD and LI (Tomblin, 2011). In particular, Tager-Flusberg and colleagues have argued for the existence of a subgroup of children with elements of ASD and LI, called autism and language impairment (ALI; Kjelgaard & Tager-Flusberg, 2001; Tager-Flusberg, 2006). Tager-Flusberg and colleagues provide evidence that the language deficits in ALI and LI extend into areas of pragmatics. This concept of overlap between the two disorders has been debated over the past decade (The recently revised DSM V indicates that LI may or may not accompany ASD). Day-to-day clinical practice reveals heterogeneity in individuals with both disorders, with the possibility of characteristics from either prototype (ASD or LI) presenting in a specific individual (Tomblin, 2011).

Social Communication Disorders and Emotional Intelligence

Emotional intelligence is defined as “the ability to perceive and express emotions, to understand and use them, and to manage emotions so as to foster personal growth” (Salovey, Detweiler-Bedell, Detweiler-Bedell, & Mayer, 2008, p. 535). Emotional intelligence encompasses several subcomponents. Most relevant to the current discussion are emotion understanding and emotion regulation. Emotion understanding includes both an awareness and understanding of one’s own emotions and the emotions of others (Harris, 2008). Emotion

regulation is an umbrella term that includes the extrinsic and intrinsic strategies used to manage emotions (Thompson, 1994). Children with social communication disorders may experience problems with aspects of emotional intelligence, including the perception, understanding, and regulation of emotion (Brinton & Fujiki, 2012).

Children with autism may be hindered in the development of emotional intelligence by a number of contributing factors. In early acquisition of pragmatic behaviors, typical patterns of joint attention and eye-gaze may be deficient (Barbaro & Dissanayake, 2012). These behaviors are initially motivated by the sharing of emotion and make important contributions to later social development (Barbaro & Dissanayake, 2012). Fundamental to joint attention is theory of mind, and researchers suggest that poor emotional intelligence may result from early deficits in this area (Castelli, 2005). Facial emotion recognition and successful social interaction have a complementary relationship; that is, the ability to recognize facial expression is necessary for social interaction, and social interaction provides the training ground for development of facial emotion recognition. Reduced quality and quantity of exposure to faces may prevent children with social communication difficulties from developing “face expertise” (Golan, 2010). Consequently, these children adopt compensatory strategies to interpret and respond to the emotional states of others (Castelli, 2005; Losh & Capps 2006).

Recent investigation has also revealed difficulties in emotional intelligence in children with LI. For example, children with LI have more difficulty than typical peers with a range of tasks, such as the basic perception of facial (Spackman, Fujiki, Brinton, Nelson, & Allen, 2005) or prosodic emotion (Fujiki, Spackman, Brinton, & Illig, 2008). These children also have difficulty with more sophisticated emotion understanding tasks, such as inferring links between a simple scenario and the emotions experienced by the participants (e.g., wanting a balloon and

being happy over receiving a balloon; Ford & Milosky, 2003) and knowing when an emotion should be dissembled (hidden) to avoid hurting the feelings of another person (Brinton, Spackman, Fujiki, & Ricks, 2007).

Impairments in emotional intelligence experienced by children with social communication disorders have particularly concerning pragmatic implications. Since emotional competence contributes to successful social interaction (Brinton & Fujiki, 2011), children with deficits in these areas often experience problems in social exchanges. Several recent studies report that children with social communication deficits do not become full participants in cooperative activities, make fewer contributions to group work, and speak less than typical peers during cooperative tasks (Brinton, Fujiki, & Powell, 1997). One reason children may not become full participants is they often have significant difficulty interpreting the emotional cues of peers (Cloward, 2012). In addition, social anxiety, which is linked to heightened patterns of arousal in developmental disorders, may in turn hinder development of emotional intelligence (Bal et al., 2010).

Effectiveness of Social Communication Intervention

Due to the persistent nature of social communication disorders and their influence on social relationships, effective intervention targeting social communication behaviors has been identified as a critical research need, especially for children with ASD (Rogers, 2000). Since deficiencies in social communication may seriously hinder children's ability to form relationships, goals targeting these behaviors are an important aspect of intervention for children with any presentation of social communication disorder. Research that has been completed shows positive effects of social communication interventions with a variety of participants. For example, interventions based on social communication and play behavior have been evaluated

and shown to increase target behaviors in preschool children with ASD (Dykstra, Boyd, Watson, Crais, & Baranek, 2012; Kasari, Freeman, & Paparella, 2006). There is also evidence for the efficacy of computerized or multimedia-based social communication interventions in the area of facial emotion recognition (Bölte et al., 2006; Faja, Aylward, Bernier, & Dawson, 2008; Hopkins et al., 2011; LaCava, Rankin, Mahlios, Cook, & Simpson, 2010). However, research specifically investigating social communication interventions for disorders such as LI is limited. According to a systematic review of the social communication intervention literature by an ad hoc committee of the American Speech-Language-Hearing Association (Gerber, Brice, Capone, Fujiki, & Timler, 2012), only eight studies were identified which investigated social communication intervention for elementary school age children with LI (Adams, 2001; Adams, Lloyd, Aldred, & Baxendale, 2006; Bedrosian & Willis, 1987; Dollaghan & Kaston, 1986; Klecan-Aker, 1993; Merrison & Merrison, 2005; Richardson & Klecan-Aker, 2000; Swanson, Fey, Mills & Hood, 2005). Of those eight studies, the only study to target emotional competence was conducted by Richardson and Klecan-Aker (2000). The intervention model in the Richardson and Klecan-Aker study, which included discussions about emotions and the identification of emotions in pictures, yielded improvements in receptive and expressive identification of emotion for school-age children.

The Purpose of this Study

The social communication intervention in this study is specifically designed to facilitate gains in the use of emotion-based words by the participants. This intervention used an increase in the production of emotion-based words as an observable indicator of increase in emotional intelligence. The data reported measure “explicit stating” of emotion-based words because consciously attending to and verbally labeling emotions leads to activation of typical social brain

regions (Harms, Martin & Wallace, 2010; Piggot, 2004). Specifically, the focus of this thesis is to determine if the type and frequency of emotion-based words used by the participants increased from baseline to post-intervention testing, thus investigating the efficacy of the intervention to increase the target behavior. The current study examined two participants diagnosed with ASD and one with LI. Informal and formal testing indicated that all three children had relatively similar profiles (difficulties with both language structure and social communication) and thus could be reasonably grouped together. At the same time, the single subject design allowed for examination of individual differences that were associated with each of the children.

Method

Summary of Intervention

This thesis is part of a larger project designed to evaluate the effectiveness of an intervention targeting emotional intelligence in children with social communication difficulties. During the intervention program, two graduate level student clinicians led participants through a dynamic and individualized series of treatment sessions. Each child received 20 sessions, each session lasting for 20 minutes. The program targeted emotional competence through an exploration of Mercer Mayer's *A Boy, A Dog, and A Frog* wordless picture-book series. As the clinician shared the stories of a boy making friends with animals, the illustrations on each page allowed participants to create their own interpretations of characters' emotions. The participant and clinician reviewed each story together several times. A series of emotion learning activities centered around the stories supported generalization of key concepts to the child's social world.

Participants

Three children participated in the emotion intervention program. The school principal and speech language pathologist of a local elementary school helped identify and recruit these participants based on their social communication problems. Of the participants, one boy (age 5;10) was diagnosed with LI, and two boys (ages 5;1 to 5;3) were diagnosed with ASD (both of these children had linguistic impairments similar to children with LI). At the onset of this program, all participants were involved in language intervention in the school setting (Harris, 2011). Participants' scores on three tests—the *Comprehensive Assessment of Spoken Language* (CASL; Carrow-Woolfolk, 1999), the *Universal Nonverbal Intelligence Test* (UNIT; Bracken & MaCallum, 2003), and typical pure tone screening tests—indicated candidacy for the program. As shown in Table 1, all participants scored within one standard deviation of the normative mean

for Full Scale IQ Score while exhibiting a CASL Composite score at least one standard deviation below the mean.

Table 1

Participant Scores: Comprehensive Assessment of Spoken Language (CASL) and Universal Nonverbal Intelligence Test (UNIT)

Participant	CASL ¹ Scores					UNIT ² Scores
	Core Composite	Antonyms	Syntax Const. ³	Paragraph Comp. ⁴	Pragmatic Judgment	Full Scale IQ Score
E.F.	78	91	67	94	76	101
M.P.	75	82	79	78	81	88
B.J.	64	71	67	70	68	108

Note. ¹ Comprehensive Assessment of Spoken Language (CASL). ² Universal Nonverbal Intelligence Test (UNIT). ³ Syntax Construction. ⁴ Paragraph Comprehension.

B.J., a Caucasian male, was 5;1 at the start of the intervention. A physician made the diagnosis of ASD when B.J. was 4 years of age. B.J. was initially placed in a preschool for children with ASD, and then moved to a small group kindergarten with children demonstrating similar difficulties. B.J. was the youngest of the three participants, but had the highest UNIT IQ score (108). Previous documentation indicated short-term memory difficulties, although cognitive capacities were within typical limits. He was also receiving Occupational Therapy (OT) and Adapted Physical Education (APE) services at the time of the study. In speech language pathology services provided by the school, B.J. had both pragmatic and syntactic goals, indicative of his overall profile of strengths and weaknesses. Clinical goals for language included making adequate requests, reducing jargon, combining utterances to form complete sentences, and using appropriate pronouns.

E.F., a Caucasian male, was 5;3 at the onset of the intervention program. The diagnosis of ASD was based on tests administered at age 2 years. Prior to this study, E.F. had been enrolled in a preschool for children with ASD. At the time of the study, E.F. participated in a group kindergarten for children with ASD. In addition, he was receiving OT and APE services. E.F. had a full-scale IQ score of 101 on the UNIT. In E.F.'s school treatment, social communication deficits were the primary targets, with speech intelligibility (articulation) and phonological processes also receiving attention. E.F. was a strong candidate for the program because, reportedly, difficulties with social skills and emotion regulation prevented him from mainstream placement.

At the time of the intervention, both children with ASD were receiving individualized pullout intervention services for the communication problems noted previously. These services were given in 20-minute sessions, twice a week.

M.P., a Caucasian male, was 5;10 at the start of the study. He was initially diagnosed with Developmental Delay at age 3,¹ but this diagnosis was subsequently changed by the educational team to LI. Indicative of this change, M.P. had a score of 88 on the UNIT. At the time of the initial diagnosis, M.P. was communicating only with vowels and gestures, although his receptive vocabulary included some nouns and verbs. He was enrolled in a special needs preschool and given speech and language intervention. At age 5, M.P. entered a mainstream kindergarten, where he performed within typical limits for academic aptitude. M.P. received language services for phonological processes and OT services for fine motor difficulties. At the

¹ All children diagnosed by the school district as qualifying for early intervention services received an initial diagnosis of developmental delay, which was then changed as was deemed appropriate as the child matured.

time of this study, M.P. was receiving individualized 20-minute intervention sessions twice a week to address his communication goals.

Intervention Procedure

During the intervention sessions, participants first used *The Boy, the Dog, and the Frog* picture books to tell the narratives without clinician prompts. Then, clinicians delivered a scripted version of the story designed to emphasize emotion labeling, inferences, contrast, and motivations. A third repetition of the story included an interactive role-play between the clinician and child, during which participants considered the emotions of various characters. Props, such as a stuffed dog, a fish net, a pail, and a toy frog, supplemented story re-enactment. Clinicians targeted causal relationships by inserting appropriate connective words (*because, if, then, since*). Participants also tracked emotions through a perspectives chart, which included boxes to indicate which emotion each character felt as a result of specific story events. After the story re-enactments, participants created a journal entry of what they learned during the session. Each journaling activity provided an opportunity to draw, color, or write events of the story. During journaling, clinicians prompted the participants to relate the experiences of the characters to events in their own lives which evoked similar emotions.

Although the story-based activities constituted the primary intervention, clinicians also supplemented these activities with two additional activities. First, participants were presented with role-play scenarios. This component of the intervention was designed to help children apply emotion understanding to every-day contexts. During one role-play activity, participants pretended to open a sack lunch and explained why they liked or disliked the foods and the emotions related to receiving various food items. They also discussed with the clinician how someone with different tastes would react to the same items.

Software activities supplemented story and role-play sessions. Mind Reading (Baron-Cohen, 2004), an interactive software program, provided participants with lessons and quizzes targeting emotion learning. This software has been shown to contribute to emotion recognition and social interaction in a single-subject design study (LaCava et al., 2010). Since the software was customizable, each participant studied a list of emotion words corresponding to the Mercer Mayer stories. Videos, pictures, and games reinforced targets previously modeled by the clinician. Often the software sparked discussion on facial cues or vocal expression, which enriched the intervention. Although the intervention included a systematic lesson plan, flexibility of the materials allowed each participant to progress at his own pace.

Baseline and follow-up procedures were also implemented in this study to create a single-subject, multiple-baseline design. Participant E.F. completed three baseline sessions before beginning the intervention, M.P. completed four prior to intervention, and B.J. completed five. Baseline measures examined the identification of facial emotions shown in black and white pictures. The pictures were presented one at a time and the participant was asked, “How is this person feeling?” The examiner faded the use of the question as the child demonstrated understanding of the task. Participants also completed these measures at the conclusion of the intervention sessions. A different examiner was used for each baseline and follow-up session to neutralize rater bias.

Analysis

The purpose of this study was to determine if the social communication intervention increased participants’ verbal production of emotion-based words in the categories of *happiness*, *sadness*, *anger*, *fear*, *surprise*, and *disgust*. Each of the sessions recorded for the three participants were coded for (a) the production of words in those categories of emotion, (b) the

form of elicitation, and (c) the accuracy of response compared to the target emotion category. Detailed coding information, with examples, is presented in the Appendix.

For production and accuracy coding, emotion-based words were considered in relation to a particular category (e.g., happy, glad, and excited were considered correct productions for the target category of *happiness*). For the purpose of this analysis, emotion-based words coded included names of specific emotions (e.g., *happy, sad, angry*) as well as descriptions of facial expressions associated with the categories of emotion (e.g., smile, frown). Coding excluded adjectives describing actions or appearances (e.g., funny, silly, weird) as well as expletives and interjections (e.g., Wow! Hey!; Cloward, 2012). Verbs such as like, love, and hate, and other verbs expressing preference were also excluded from the analysis. Emotion words in the category of *disgust* were treated as control items, since they were not taught or targeted during the intervention sessions.

In order to code the methods of elicitation, productions were divided into four categories: *spontaneous, cued, imitated, and in response to a question*. Emotion-based words were coded as spontaneous if not preceded by clinician questions or prompts, cued if produced after a phonological or facial prompt (e.g., “/h/...” for happy or a frowning face to cue the production of “sad”), and imitated if produced within five seconds after a matching production from the clinician. The code “Question” was designated for emotion-based words produced in response to a clinician’s query such as, “How does the dog feel?”

Valence coding examined whether the emotion-based word produced matched the valence of the target. For the purpose of this study, *happiness* was considered a category of positive valence, and *sadness, anger, fear, and disgust* were considered categories of negative valence. *Surprise* was coded as either positive or negative valence depending on the story

context in which it was used. In this coding category, productions were determined to either agree or not agree (valence error) with the valence of the target emotion word. For example, a production of *afraid (fear)* when the target category was *happiness* was coded as a valence error, while a production of *afraid* when the target category was *sadness* was coded as a valence agreement.

To establish reliability, three research assistants (two graduate students and one undergraduate student at Brigham Young University) coded 10% of the intervention sessions. Comparisons revealed inter-rater reliability for the coding of emotion-based words at 89%.

Due to the nature of the intervention activities, a specific number of emotion-based words in any given category was not elicited or required of the participants. Number of productions in each category varied between sessions and participants. For that reason, the sessions were evaluated for overall accuracy of production with percentage calculations for each of the six categories of emotion.

Results

Accuracy of Productions in Emotion Word Categories

The coding data from baseline, intervention, and follow-up sessions were compiled to obtain the percentage of appropriate usage in context for each of the six categories of emotion for each of the three participants. Data are included for the categories of *happiness*, *sadness*, *anger*, *fear*, *surprise*, and *disgust*. These results are presented in Figures 1-5. Detailed results including emotion word counts, production and target match percentage, and valence accuracy are presented in Appendix B.

Happiness. Figure 1 includes the percentage of words accurately produced in the category of *happiness* by each of the three participants. The data show that each participant was generally proficient in the recognition of happiness for the baseline measures. This proficiency continued, with slight variability, throughout the intervention program. Follow-up scores show the participants maintained the ability to recognize happiness after the intervention program. Based on the baseline data, *happiness* was not considered a primary target. Since the general intervention provided opportunities to model *happiness*, however, performance was tracked. The fact that participants produced *happiness* words at a high level throughout the intervention confirmed the decision not to target this emotion word category.

Sadness. Accuracy percentages for productions of words in the category of *sadness* are presented in Figure 2. *Sadness* showed variable results throughout the intervention program, but each participant improved from baseline to follow-up, with the exception of E.F., who maintained perfect accuracy scores in baseline and follow-up measures. Similar to *happiness*, *sadness* was produced at a high level of mastery by all three children. Thus, *sadness* words were

Happiness

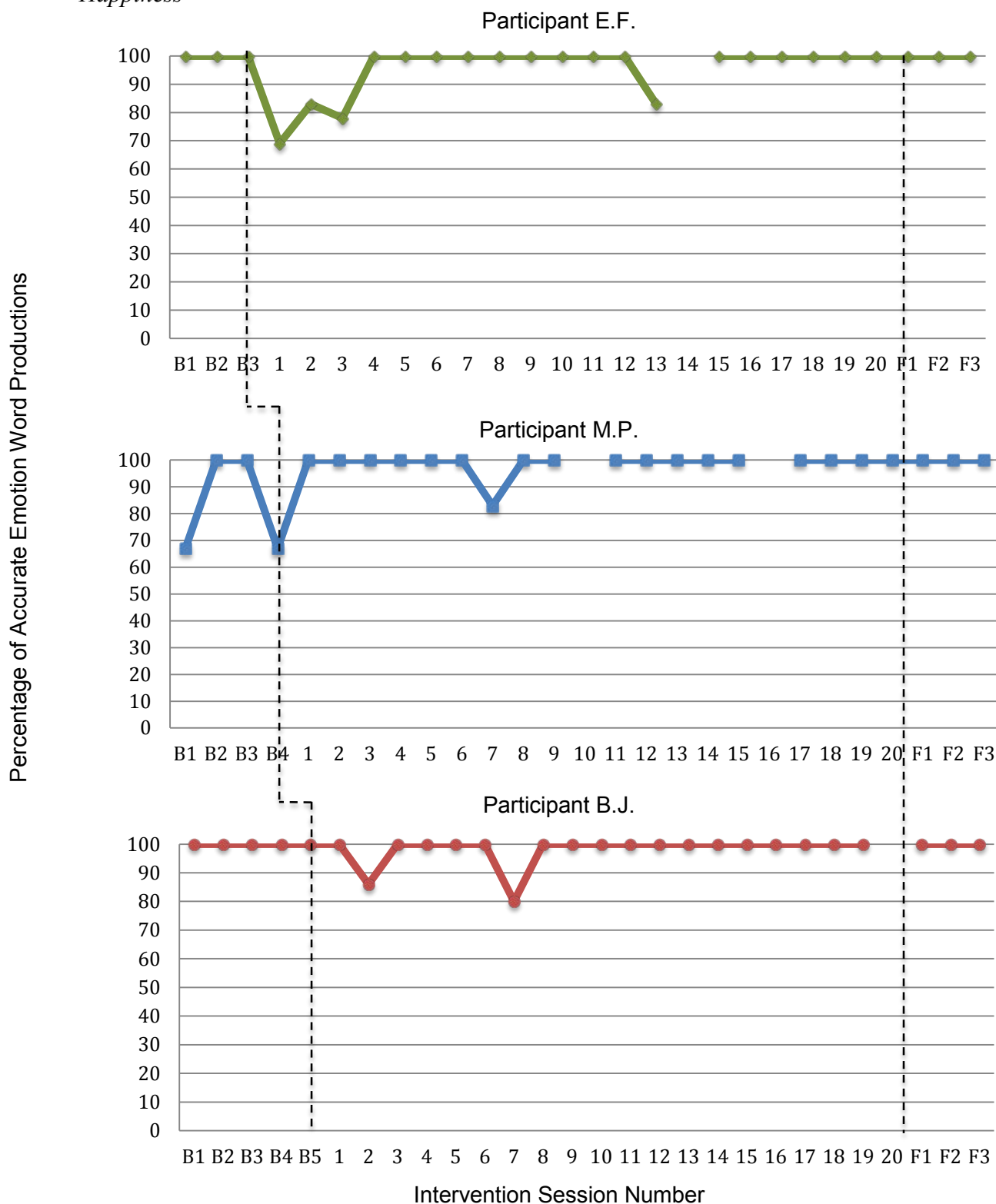


Figure 1. Participants' production accuracy across baseline, intervention sessions, and follow-up in the category of happiness.

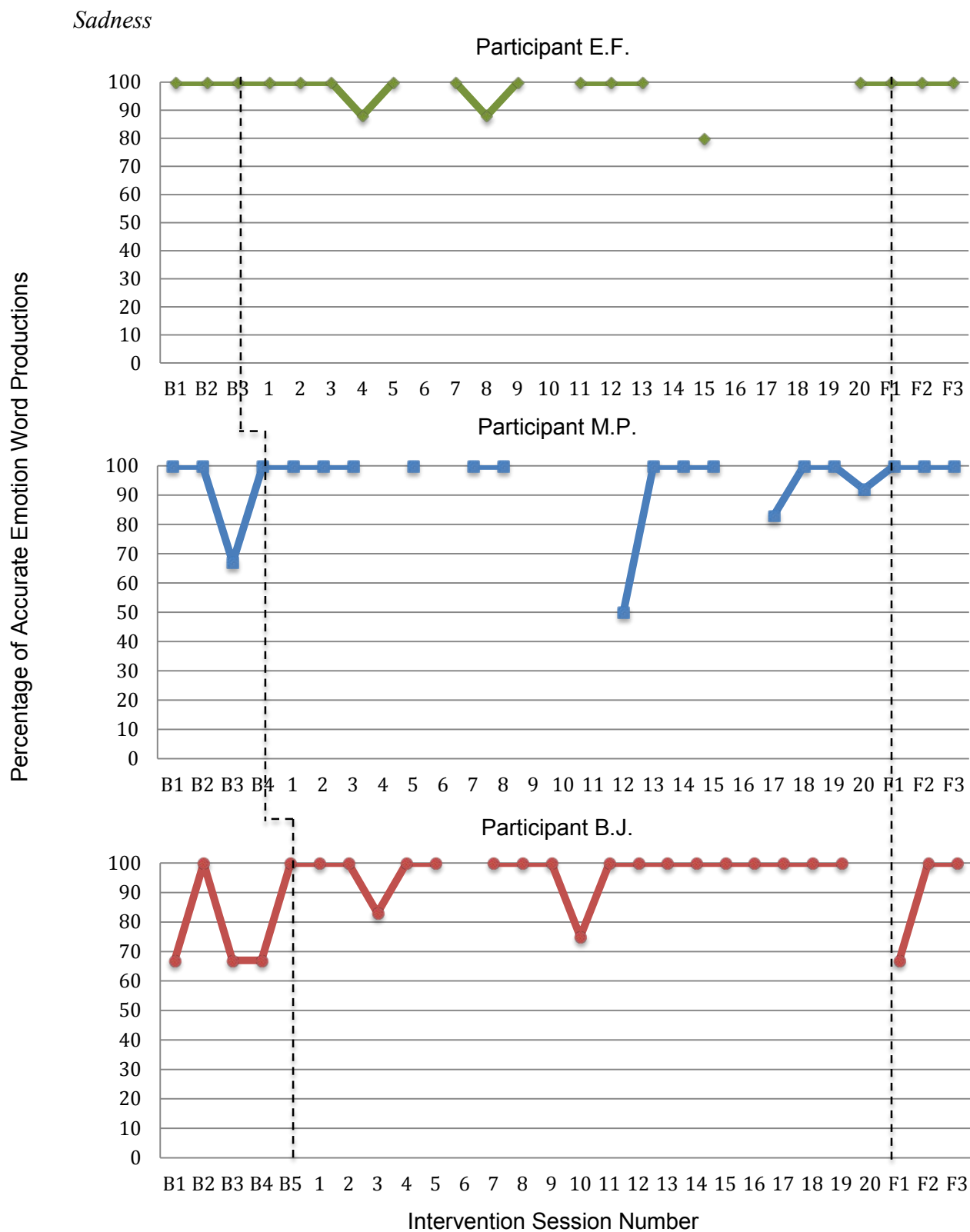


Figure 2. Participants' production accuracy across baseline, intervention sessions, and follow-up in the category of *sadness*.

not considered a specific target in intervention. The production of these words was tracked, however, as the general intervention allowed these words to be modeled. All three participants had perfect accuracy scores for several sessions during the intervention and some instances of inaccurate productions during select sessions. The participants obtained perfect accuracy scores during the majority of follow-up measures. Participant M.P. increased from an average of 92% accuracy to 100% accuracy from baseline to follow-up. With the exception of session 12 (50% accuracy), his intervention scores were above 80%. Participant B.J. averaged 80% accuracy for baseline and 92% accuracy for follow-up, with all intervention accuracies above 70%.

Anger. Accuracy percentages for productions of words in the category of *anger* are presented in Figure 3. *Anger* was considered as a viable target for E.F. and M.P. and was monitored for B.J. *Anger* showed the most improvement of the six emotion categories for the combined participant group from baseline to follow-up. E.F. and M.P. demonstrated some baseline scores of less than 40%, and at least one follow-up score of 100% for the facial emotion recognition task. In addition, each participant showed a significant increase in accuracy on *anger* near the very beginning of the intervention sessions, suggesting that the supportive nature of the intervention program was effective in assisting the development of this emotion concept. Participant E.F. demonstrated an emerging production accuracy of *anger* during the baseline measures, followed by an immediate improvement in sessions 1-2 of the intervention. His scores increased on follow-up measures by an average margin of 34%. Participant M.P. averaged 33% accuracy during baseline measures, showed some variability in the first several sessions of intervention, and then showed near-consistent mastery for the second half of the intervention and follow-up sessions. Participant B.J. showed variable performance for baseline measures (average

Anger

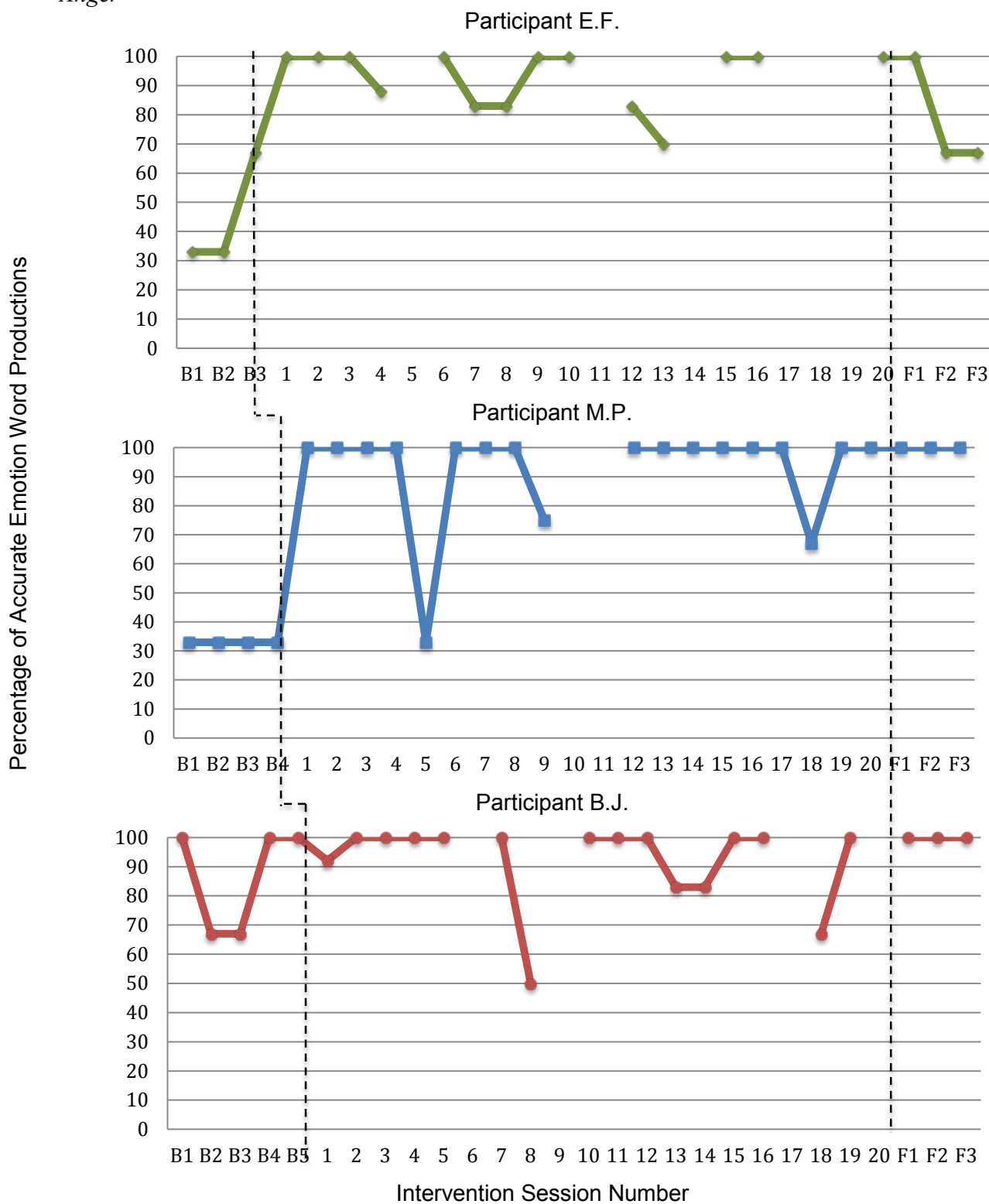


Figure 3. Participants' production accuracy across baseline, intervention sessions, and follow-up in the category of anger.

87%), which increased to a stable 100% accurate identification during follow-up measures. The participants' performance in the category of *anger* suggests that the intervention facilitated improvement of facial emotion recognition as measured in both the literature context and the picture identification task.

Fear. Figure 4 shows the percentage of accuracy for the three participants for the category of *fear* throughout the intervention program. For two of the three participants (E.F. and B.J.), fear was the least-used category of the emotion words during the intervention sessions. Participant E.F. was the only participant who demonstrated a general improvement from baseline to follow-up measures (average of 22% to 44%), although all three participants showed improved accuracy by the second-half of the intervention sessions. Participants B.J. and M.P. both exhibited perfect accuracy scores in several intervention sessions, but did not correctly identify *fear* in any of the follow-up measures.

Surprise. Accuracy percentages for the category of *surprise* are presented in Figure 5. *Surprise* proved to be the emotion category with the most variable results. However, all participants demonstrated some degree of improvement from baseline to follow-up. Participant E.F. increased from 78% accuracy to 100% accuracy from baseline to follow-up, although his intervention session accuracies were highly variable. Participant M.P. increased from an average of 58% on baseline measures to 89% on follow-up measures. During the intervention, he exhibited a broad range of scores as well as several sessions during which no *surprise* words were used. Participant B.J. did not accurately recognize *surprise* until session 4, after which he demonstrated significantly improved accuracy. He maintained accuracy through the follow-up measures. Although the participants showed improvement in *surprise* productions, performance in this category throughout the intervention program confirmed findings from previous studies

Fear

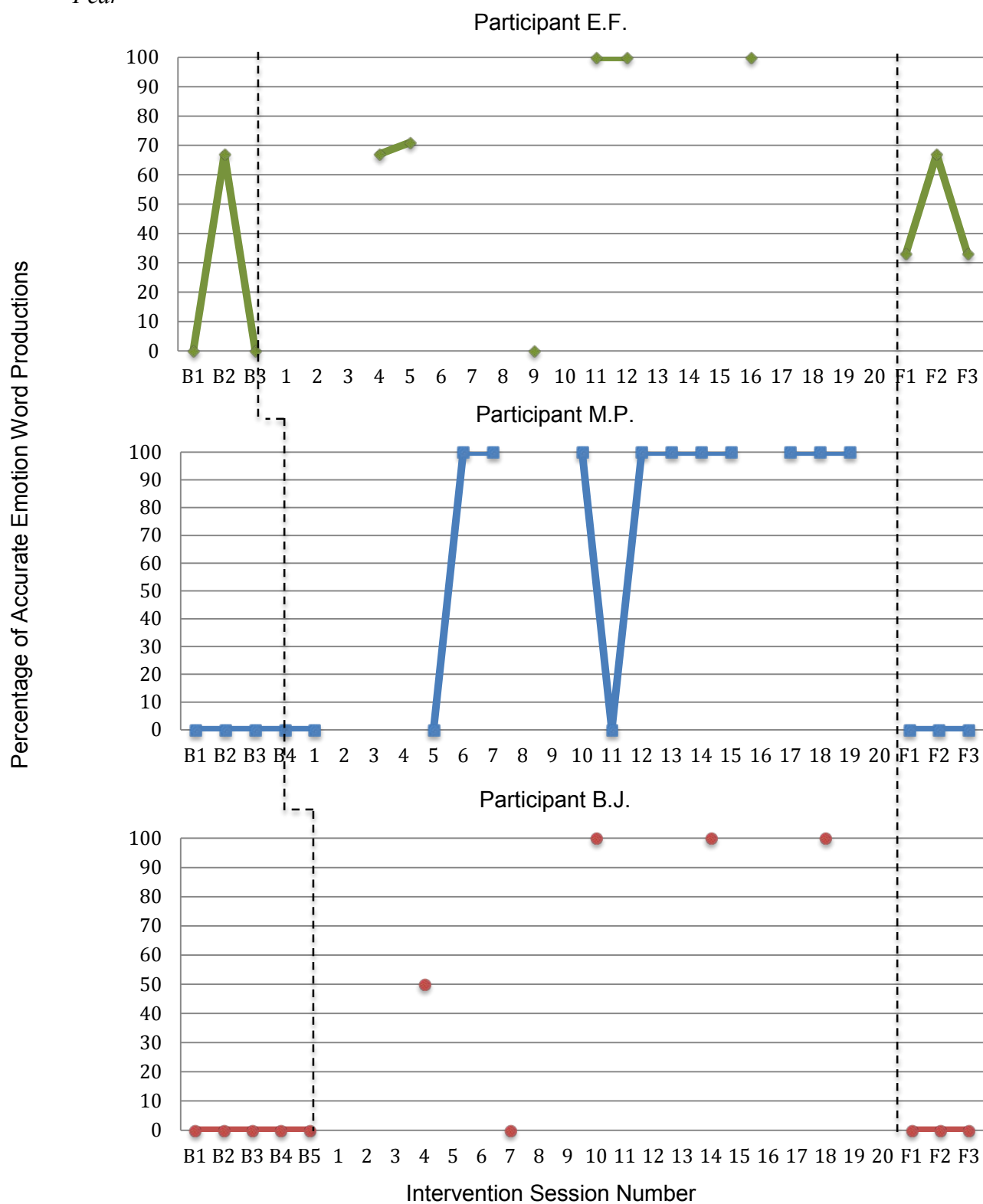


Figure 4. Participants' production accuracy across baseline, intervention sessions, and follow-up in the category of *fear*.

Surprise

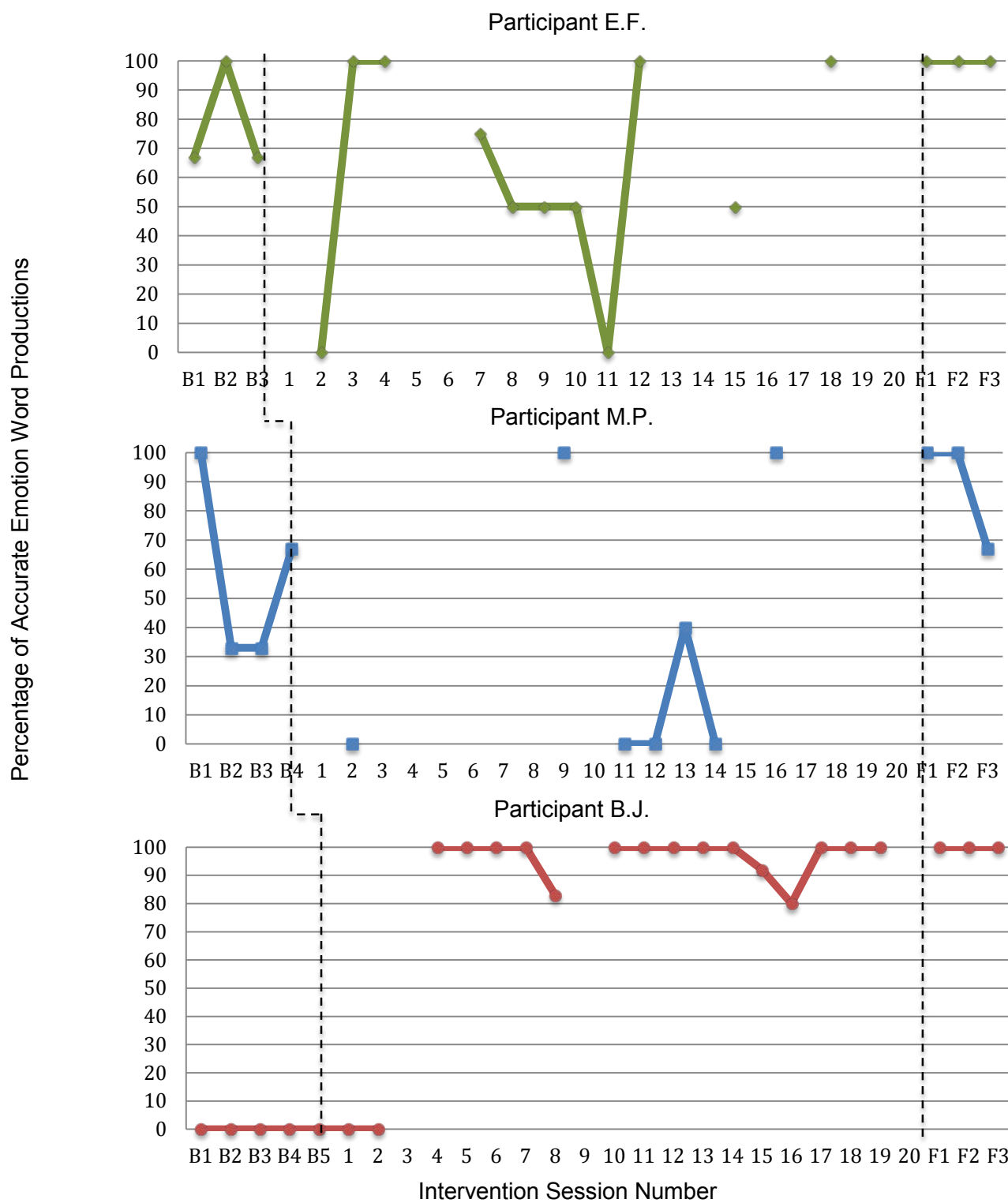


Figure 5. Participants' production accuracy across baseline, intervention sessions, and follow-up in the category of *surprise*.

that children with social communication disorders have difficulty identifying and understanding *surprise* (See Discussion for further detail).

Disgust. The emotion word category of *disgust* served as a control variable and was not explicitly taught in the intervention program. Accuracy for the category of *disgust* is not presented graphically because fewer than three productions in this category were observed for each of the participants during the intervention program. Participants demonstrated difficulty identifying this emotion in both baseline and follow-up measures; no participant correctly identified *disgust* before or after intervention. The fact that *disgust* was not explicitly taught, and did not change, suggested that change observed in other emotion words could be attributed to the intervention.

Valence Accuracy

Percentage was determined for each participant for each session for the number of emotion words produced correctly divided by the total emotion words produced. Each emotion word produced by the participants was determined to be of positive or negative valence. Productions in the categories of *happiness* and *surprise* (when the emotion was the result of a desired outcome) were considered to have positive valence. Productions in the categories of *sadness*, *anger*, *fear*, *disgust*, and *surprise* (when the emotion was the result of an undesirable outcome) were considered to have negative valence. Valence of the word produced was compared to valence of the target word in context to determine valence agreement. Valence agreement was calculated for each participant for each intervention session and compared to overall production accuracy to determine the percentage of errors in each session that had incorrect valence. For example, if a participant made six production errors, two of which had incorrect valence, the percentage of total errors with incorrect valence would be 33%. Results for

overall accuracy and valence accuracy by session are presented in Appendix B. For the combined baseline, intervention, and follow-up sessions, Participant E.F. had a valence error percentage of 16% during the intervention sessions, meaning that 16% of his errors were either replacing a positive emotion word with a negative emotion word or vice versa. His total valence agreement increased from 93% during baseline testing to 100% during follow-up testing.

Participant M.P. had a valence error percentage of 21% during the intervention sessions. His total valence agreement was 93% at baseline and remained at 93% at follow-up. Participant B.J. had a valence error percentage of 27% during the intervention sessions. At baseline, his valence agreement was 81%, which increased to 91% at follow-up. For a view of how these valence error percentages fluctuated throughout the intervention, see Appendix B. Since the number of possible emotion categories with positive valence were fewer than those with negative valence, valence errors were more likely to involve the replacement of a positive emotion word for a negative one, rather than the replacement of a negative emotion word for a positive one. These results signify that the intervention program contributed to the improvement of valence accuracy for two of the three participants from baseline to follow-up.

Discussion

This study was part of a larger project evaluating the efficacy of a social communication program designed to improve the emotional intelligence of three elementary-age participants. Data were obtained and analyzed for the participants' explicit use of emotion-based words during baseline, intervention, and follow-up sessions. The following section includes a discussion of combined results in relation to previous research, as well as additional observations from the intervention, a discussion of valence agreement outcome, and a statement of conclusion.

As mentioned previously, children with social communication disorders often experience difficulty with tasks involving the understanding or expression of emotions (Bal et al., 2010; Brinton & Fujiki, 2012; Castelli, 2005; Golan, 2010; Spackman et al., 2005). This difficulty was evident during the intervention as participants verbally expressed frustration with the therapy tasks. Participant E.F. showed difficulty regulating his own emotions during several of the intervention sessions. His emotional reactions to the intervention highlighted the challenges that children like E.F. experience with socio-emotional tasks. On some occasions he remarked, "I don't like that—it's hard," or "This book is not easy for me." After brief periods of distress, he was able to return to the task and refocus on the learning context. Despite the challenging nature of the story enactment and supplementary activities, the participants reacted positively to the majority of the therapy tasks, especially as they were familiarized with the expectations of the intervention context. The combined participant results show promise for this type of intervention for increasing emotional intelligence of children with social communication disorders.

Other studies have documented that individuals with social communication disorders may perform well with identification and use within the categories of *happiness* and *sadness* (Gross, 2004, Spackman et al., 2005), while demonstrating more difficulty with *fear*, *surprise*, and

disgust (Brinton et al., 2007; Castelli, 2005; Fujiki et al., 2008; Grossman, 2000; Humphreys, Minschew, Leonard, & Behrmann, 2007). Although individual performance proved variable, a similar trend was observed in this study throughout the intervention program. Categories of *happiness* and *sadness* were generally well-known prior to the intervention, while other categories proved more difficult. Results show that of the emotion categories, the context of the intervention was particularly effective for improvement of production accuracy for *anger*. In addition, the participants improved in production accuracy in the category of *surprise*. This finding is significant, since *surprise* requires an appraisal of the character's pre-event beliefs and expectations and is considered to be one of the more challenging emotions to master (Jones et al., 2011; Loveland et al., 1997; Wright et al., 2008).

Fear proved to be the most challenging of the emotion categories, even during the conclusion and follow-up intervention tasks. Based on participant results in the category of *fear*, it is possible that the context of the story enactment task was sufficient to assist the participants in learning *fear*, but that this knowledge did not generalize to identifying *fear* in follow-up measures. It is of note that in several instances, participants confused *fear* with *surprise* in the identification of emotion on faces tasks. This was likely due to the participants mistaking the "wide eyes" depicted in the *fear* photographs to represent eyes in expressions of *surprise*. Similar errors have been reported in other research examining emotion recognition in children with ASD (Grossman, 2000). Research also notes difficulty with *fear* is more pervasive in the long-term with this population (Humphreys et al., 2007; Law Smith, Montagne, Perrett, Gill, & Gallagher, 2010). A combined view of these findings confirms that the emotion category of *fear* is a viable intervention target for children with social communication disorders across a wide range of ages.

Additional Observations

Results suggest that the scripted nature of the intervention was suitable to support learning and production of emotion words in context. These improvements transferred to follow-up activities in several occasions. For example, all of the participants showed an increase in spontaneous emotion words used during independent retell tasks. These tasks were administered at the beginning of approximately every two intervention sessions. During the first independent retell, M.P. used no emotion words while telling the story. During his ninth independent retell, he used 14 emotion words accurately while telling the story. This increase in spontaneous, accurate emotion word use signified that the context of the intervention was successful for “emotion learning” in many instances.

Participants’ ability to determine emotion causation was not formally tracked, but one participant, M.P., made significant gains in this area. The following sequence exemplifies his progress in this regard:

Session 6

Clinician: Why is the boy happy?

M.P: ‘Cause I drew him was happy.

Session 10

Clinician: Why is the boy angry?

M.P: ‘Cause them gonna catch him

Session 18:

Clinician: What’s the turtle thinking?

M.P: Him happy because him alive.

This sequence illustrates a gradual increase in sophistication of responses to emotion inferencing questions. Early in the intervention, M.P. answered questions with weak causal links such as the example from Session 6. He eventually progressed to answering inferencing questions with an emotion and explanation, even when an emotion cue was not provided in the elicitation question.

In contrast, participant B.J. experienced difficulty throughout the intervention with determining the reason behind the emotion. Of the participants, B.J. imitated the clinician most frequently; “Repetition” was coded more often for his emotion words comparatively. Frequently, when he was asked why a character felt a certain way, he answered by imitating the emotion word in the question. Based on these observations, it is apparent that the intervention program assisted B.J. in improving accuracy of use of the majority of the emotion categories, but that the intervention method or his current capacity was inadequate to learn why these words were correct in specific contexts. Given the relatively short course of treatment, it may be the case that if intervention had continued, B.J. would have been able to develop this type of knowledge.

Valence Agreement

Valence agreement calculations showed that a significant portion of errors in accuracy of emotion based words made by the participants also had incorrect valence. Errors in valence while interpreting emotions can lead to significant communication breakdowns (Ford & Milosky, 2003). Between baseline and follow-up testing, this error type decrease in two of the three participants. For the third participant (M.P.), valence errors typically involved misattributing *happy* to unknown emotion contexts. M.P. most likely made this mistake because *happy* was the most well-known emotion category at the onset of intervention, making it more accessible to the participants than other, less known categories. Other errors exhibited by the participants included

attempting to correct the clinician (For example, stating “No, that is *not happy*” when *happy* was mentioned as a character’s emotion) and misattributing *anger* or *fear* for contexts in which the character was positively surprised. The latter error type may have arisen because of a tendency to analyze a single feature of the face, such as the eyes (wide eyes were often attributed to *fear*) or the mouth (an open mouth signified *surprise* in some cases and yelling in anger in other cases). These errors decreased as the participants became more familiar with the story event context in which these particular emotions were expressed. However, the results suggest that single-feature analysis may have persisted in follow-up testing, especially in the category of *fear*.

Conclusion

The results of the intervention program showed variable outcomes for each of the participants. However, the growth in accuracy of emotion-based word category productions and valence accuracy in selected areas supports the idea that social communication intervention programs specifically targeting emotion word production can yield positive effects. In general, the results revealed that accuracy in the emotion categories which most or all of the participants had mastered prior to the onset of the intervention (*happiness* and *sadness*) was maintained or supported across the intervention sessions. Categories of *anger* and *surprise* showed improvement in all participants, while the category of *fear* showed improvement in one of the three participants. Although improvements were demonstrated in these categories, participants continued to produce some errors in follow-up measures, especially in the category of *fear*. *Disgust* served as a control variable and was not explicitly taught in the intervention program. Results showed that *disgust* was an effective control, as none of the participants correctly identified *disgust* in the baseline or follow-up measures. Two of the three participants exhibited a significant increase in valence accuracy from baseline to follow-up testing.

Directions for Further Research

Several limitations may have impacted the results of this study. Because of the small sample size, results should be interpreted with caution. A larger participant group is needed to assume generalization of the results to the population at large. Further research might lengthen the current study and allow more time between pre- and post-intervention testing to examine the effect of a longer program on the same measures (the current study took approximately five months between pre- and post-intervention testing). Based on the results in the current study, future intervention designs should increase the breadth and depth of exposures in the category of *fear* and strengthen the distinction between *fear* and *surprise*. Further research might also incorporate various other forms of intervention to investigate the results of this program in combination with other programs. For example, the inclusion of peer interaction activities may contribute to increased generalization of the social communication gains to settings involving peers.

Another limitation of this study was that the intervention program was administered by two clinicians alternating between treatment sessions. Each clinician had a unique interactional style; one clinician elicited emotion words primarily by asking questions, and the other elicited emotion words through frequent use of picture and facial feature descriptions. Although the alternating pattern may have controlled for overall average accuracy, the different interactional styles may have also affected the accuracy during individual sessions. In addition, the actual length of each intervention session was slightly variable depending on the preference of the clinician regarding allowing a participant to finish an activity or declining to start a new activity and ending a session early. Timing factors are difficult to control in clinical settings, and that element of variability may have affected the results observed in the current study.

The larger study investigating this social communication program included a comparison of specific social behaviors, pre- and post-intervention, through completion of the *Teacher Behavior Rating Scale (TBRS)*; Harris, 2011). However, future research in this area could also examine the transfer of treatment targets to real social situations (Piggot et al., 2004).

Researchers have noted that although children with social communication disorders may have the ability to identify emotions when presented with pictures of facial expressions, this ability may not be equivalent to the speed and accuracy required to identify emotions in social situations (Loveland et al., 1997). In the story enactment context of this intervention, gestures and posture were occasionally mentioned in the explanation of emotions addressed by certain characters, along with facial features. Future intervention programs could include specific exploration of these extra-facial features in multiple contexts to strengthen identification of emotion through these additional channels.

Summary

Recent research has demonstrated that children with social communication disorders exhibit difficulty with emotional intelligence. Deficits in emotional intelligence may contribute to a variety of problems in the context of social interaction. This study examined the influence of a social communication intervention on the accuracy of emotion-based word use in three school-age children with social communication disorders. Productions were analyzed in the categories of *happiness, sadness, anger, fear, surprise, and disgust*. According to the results of this study, the method of the intervention program was effective in improving the accuracy of emotion word productions in all categories except *fear*. Improvements in *fear* were observed during intervention treatment sessions, but this learning did not generalize to follow-up testing for two of the three participants. In addition, two of the three participants demonstrated increased

valence accuracy between baseline and follow-up testing, while the third participant showed stable valence accuracy prior to and after the intervention sessions. Results of this study reflect the heterogeneous nature of social communication disorders and support the need for individualized intervention programs targeting social communication deficits.

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Appendix A

Annotated Bibliography

Adams, C. (2001). Clinical diagnostic and intervention studies of children with semantic-pragmatic language disorder. *International Journal of Language & Communication Disorders*, 36(3), 289-305. doi: 10.1080/13682820110055161

Adams identified two case studies of children with pragmatic language impairment (PLI) and described the relevance of the semantic-pragmatic language disorder (SPLD) label in spite of the variability in the children's impairments. The purpose of this study was to discuss the treatments, clinical outcomes, and limitations in methods used to treat children with similar diagnoses.

Participants in this study were age 7 and 10 and demonstrated expressive and receptive language delays. Researchers obtained a conversational sample from Participant A (age 10) and analyzed and coded the sample for features of social appropriateness such as informativeness, relevance, completeness, and length. After therapy, Participant A demonstrated increased pragmatic matching, with decreased inadequate or problematic responses. Participant B participated in narrative and memory assessments, IQ testing, fluency measures, and word finding measures. In a follow-up assessment, Participant B showed an increase in word-finding ability that placed him within typical range. In addition, he showed increase in narrative skills and some improvement in syntactic ability. Verbal concept development and willingness to communicate were also shown to increase.

Relevance to current work: This study used two participants to illustrate that the diagnostic classification of SPLD may not be useful because of the differing intervention methods used to treat two children with that diagnosis. The author suggests that the term PLI would be more accurately used to describe these children. This study provides support for the rationale behind the mixed-diagnosis participant group in the current study.

Adams, C. (2005) Social communication intervention for school-age children: Rationale and description. *Seminars in Speech and Language*, 26(3), 181-188. doi: 10.1055/s-2005-917123

In this article, Adams states the purpose of social communication intervention and explains the need for such programs with children with social communication problems. Since social communication difficulty is not unique to one diagnostic group, it is appropriate to apply the guidelines in the article to a variety of children with interpersonal communication problems at early ages. Children with social communication problems (SCPs) represent a fast-growing population for speech-language intervention. Although children with pragmatic language impairment (PLI) can be distinguished from children with specific language impairment (SLI) based on pragmatic behaviors, these children all have SCPs in common. Research explains that the source of SCP for children with SLI may be lack of language experience or limited language repertoire (secondary pragmatic impairments). Children with high functioning autism spectrum disorders (ASD) show limitation from adverse social development, regardless of language status (primary pragmatic impairments). Adams argues that this format of examining SCP may be too simplistic and may not support appropriate directions for intervention.

Social development depends on the joint emergence of social interaction, social cognition, pragmatics, and language processing. Disruptions in any combination of these factors may contribute to SCP, and therefore support the need for social communication intervention, regardless of diagnosis. For example, Adams explains that underlying SCP are limitations in social cognition, which prevent the child with SCP from adequately processing information about the people in an environment. The framework described in this article focuses on weaknesses in social development in each individual child, irrespective of diagnosis. Social adaptations recommended were based on developmental readiness, environmental modifications, school curriculum modifications, and response monitoring. Intervention targets focused on facilitating emotion understanding, enabling flexibility, introducing inferencing and metaphorical thinking, and focusing on coherence for comprehending texts and events.

To investigate the results of the proposed intervention framework, a single case study series focusing on six school-age children was reviewed. One case was investigated in detail: that of an eight-year-old male with significant impairment in all four components of social development mentioned previously. The participant received 24 therapy sessions using the intervention framework. Post-intervention, the participant showed modest gains in comprehension of narratives, but some pragmatic issues continued. He demonstrated significant gains in conversational skills, which reportedly generalized to the home and school environments.

Relevance to current work: Adams states that social communication requires the coordination of many factors, which may be impaired in any combination in a child with social communication impairment. This multi-faceted definition is included in the Introduction of the current work. In addition, definitions and intervention frameworks explored in Adams' study emphasize the need for social communication intervention for children with SCP regardless of the etiology of the problems and the corresponding diagnosis. This pattern of thought was implemented in the current study when grouping the participants with differing diagnoses under the umbrella term of social communication impairment. Elements from the SCP intervention framework described in Adams' study were also used in the intervention in the current study.

Adams, C., Lloyd, J., Aldred, C., & Baxendale, J. (2006). Exploring the effects of communication intervention for developmental pragmatic language impairments: A signal-generation study. *International Journal of Language & Communication Disorders*, 41(1), 41-65. doi: 10.1080/13693780500179793

The goal of this research was to determine whether improvements could be achieved by children with pragmatic language impairment (PLI) based upon individualized intervention plans targeting interpersonal communication in familiar social environments.

Six children with an isolated PLI diagnosis were recruited for this study. The participants were between age 6;0 and 9;11. The children were selected on the basis of pragmatic language impairment in the absence of autism diagnosis. They had not received therapy targeting pragmatic skills within three months of the study. The design of the study was single-case model with three children participating during an initial school term, and three children participating during the second school term. Each child received three, one hour long individual therapy sessions per week for eight weeks. Assessments such as the *Autism Diagnostic Interview-Revised*, *Children's Communication Checklist*, *Conversation Assessment Task*, *Clinical Evaluations of Language Fundamental*, *British Picture Vocabulary Scale*, and *Bishop's Assessment of Language Impaired Children* were administered pre-therapy. Intervention

followed pragmatic therapy practices, including activities based around interpersonal communication and strategies to facilitate effective communication with others. Therapy targets were chosen based on suggestions from parents and teachers. Post-treatment assessments showed variable results, although all children showed improvement in communicative behavior on some measures of conversation. In other words, the outcome showed that the intervention employed in this study had potential to facilitate changes in language processing and pragmatic skills. In addition, parents and teacher noted that gains made were evident in conversational skills, social flexibility, and attention in the classroom, showing generalization effects.

Relevance to current work: This study indicated that children with language impairment (LI) and children with PLI may both benefit from intervention based upon pragmatics, and that generalization is noted post-treatment with individualized therapy design. The current study was based upon an intervention targeting social communication in children with LI and autism spectrum disorders. This study supports the need for and supposed effectiveness of such intervention programs and related efficacy studies.

Adolphs, R. (2001). Abnormal processing of social information from faces in autism. *Journal of Cognitive Neuroscience*, 13(2), 232.

It has been suggested that symptoms of high-functioning autism (or ASD) lean heavily toward deficits in cognition relevant to social communication. These findings are supported by empirical data which show that individuals with high-functioning autism can selectively show deficits in interpreting and reacting to the mental states of others. Adolphs describes a few key points of the research with autism and the amygdala, including the finding that there may be some links between amygdala dysfunction and problems with emotional competence found in ASD. In order to compare individuals with ASD to individuals with amygdala lesions, this study includes four experimental tasks targeting the recognition of emotional and social information from faces and lexical stimuli. Eight participants with high-functioning autism were compared to a group with bilateral amygdala damage and also a group of typical controls. The participants with ASD did not show any deficits in discriminating the intensity of emotional expressions compared to normal controls. On the second experiment (facial emotion recognition), participants with ASD performed better than subjects with amygdala damage and “generally in the range” of typical controls, although individual performance proved variable. In the next experiment, the group with ASD rated a set of faces significantly more trustworthy and approachable (with positive labels) than the control group. For the last experiment, individuals in the group with ASD gave responses typical to controls when rating “likeability” of personality attributes as well as short biographies of personalities.

Relevance to current work: This study acknowledges the heterogeneous nature of social communication disorders and the reality that some individuals with ASD score well within typical range on emotion recognition tasks. This research also suggests that individuals with emotion recognition impairments cannot necessarily be compared to persons with bilateral amygdala damage in terms of performance on these tasks.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (DSM-V). Washington, DC: American Psychiatric Association.

The Diagnostic and Statistical Manual of Mental Disorders V (DSM-V) is the most recent manual for diagnostic information in this category provided by the American Psychiatric Association. The diagnostic criteria for the diagnoses of autism spectrum disorder (ASD) are mentioned in the current work, and those criteria will be summarized in the following annotation.

For a diagnosis of autism to be established, there must be persistent deficits in social communication and social interaction in multiple contexts. Examples of these deficits include the following: reduced social-emotional reciprocity, reduced nonverbal communicative behaviors, and difficulties developing, maintaining, and understanding relationships. Autism may also include patterns of restrictive or repetitive behavior, such as stereotyped or repetitive motor movements, insistence on sameness and adherence to routines, highly restricted interests, or abnormal reaction to sensory input. Symptoms must be present in early development and cause significant impairment in important areas of functioning.

Individuals with ASD may be specified with or without accompanying intellectual impairment, with or without accompanying language impairment, and/or associated with known medical or genetic condition or environmental factor. Three level of severity are proposed, which depend on the level of support required by the individual to function in daily environments.

Relevance to current work: The DSM-V provides the most current diagnostic information for the diagnosis of ASD. The current work uses these criteria to describe the social deficits associated with ASD.

American Psychiatric Association (2013, May 8). Social (pragmatic) communication disorder. Retrieved from www.psych.org/File%20Library/Practice/DSM/DSM-5/DSM-5-Social-Communication-Fact-Sheet.pdf

This document from the American Psychiatric Association describes a new diagnosis included in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5): Social (Pragmatic) Communication Disorder (SCD). Individuals bearing this diagnosis are described as impaired in their “ability to effectively communicate, participate socially, maintain social relationships, or otherwise perform academically or occupationally.” SCD involves difficulty with expressive language and pragmatic (conversational) behavior which limits effective communication. This emerging diagnosis was created to ensure that individuals with these specific deficits received appropriate services. Previously, individuals with such impairments may have been identified as not otherwise specified pervasive developmental disorder (PDD-NOS), which affected available treatments. It is noted that autism spectrum disorders (ASD) must be ruled out for an individual to be diagnosed with SCD. In conclusion, the proper identification of “distinct communication problems” is essential for appropriate intervention.

Relevance to current work: This emerging diagnosis of SCD was mentioned in the Introduction of the current work to explain the idea that social communication impairment can not only occur concurrently with other diagnoses, but as a distinct diagnosis. Further research could evaluate the effectiveness of social communication intervention specifically for individuals with a diagnosis of SCD.

Ashwin, C., Baron-Cohen, S., Wheelright, S., O’Riordan, M., & Bullmore, E. T. (2007). Differential activation of the amygdala and the ‘social brain’ during fearful face-processing in asperger syndrome. *Neuropsychologia*, 45(1), 2-14.

Typical individuals may use the ‘social brain’—areas of the occipital and temporal cortices, the amygdala, orbito-frontal cortex (OFC) and the anterior cingulate cortex (ACC)—for social information processing. Specifically, the inferior occipital gyrus (IOG), superior temporal sulcus (STS) and the superior temporal gyrus (STG) may be used for face processing. Faces provide important information about emotional states. The amygdala is involved in determining the emotional connection (e.g., empathy) to observed facial features. Previous research has noted that people with autism (or ASD) use different cognitive strategies for completing face-processing tasks. Also, people with amygdala damage have been known to display deficits in social judgment and understanding mental states of others. Even with this knowledge, studies have been inconsistent in reports of the amygdala and autism. This study sought to clarify misconceptions about facial content processing in individuals with high-functioning autism (or HFASD). This study compared 13 males with HFASD to 13 typical controls on tasks of viewing and identifying facial expression. After a training session, participants viewed four different facial expression picture types: high-intensity fear, low intensity fear, neutral expression, and scrambled faces. Each participant viewed a total of 128 pictures. For this task of neuroimaging, participants were only required to quickly press a button when a picture appeared. A second task presented pictures and participants identified the emotion shown in the picture (fear, anger, disgust, surprise, and sadness). 160 EPI images were gathered for each participant, which were then sliced into 21 transaxial slices each. Repeated measures ANOVA was used to analyze the results of the second task. Results show that on the emotion labeling task, the Group with ASD performed significantly poorer than the control group. For emotion-specific results, fear was recognized less frequently than anger, sadness, or surprise. Results for the neuroimaging task show that the control group had more amygdala and left OFC activation, while the autism group showed more activation in the superior temporal cortex and the ACC. The superior temporal cortex is associated with attention to facial features, such as the eyes and mouth—more “perceptual” aspects. The ACC is associated with “conscious awareness and attention to emotional processes.” In other words, the group with autism may have applied more conscious effort to interpret the stimuli, supporting the notion of a “systemizing” strategy. In addition, activation of the MPFC—a region used to interpret the mental states and emotions of others—appeared in controls during the neuroimaging tasks, but not in the group with ASD. The control group also displayed intensity-dependent amygdala activation, while the group with ASD did not show activation in the amygdala or other areas to varied intensities of fearful expressions. These results support the amygdala theory of autism.

Relevance to current work: Ashwin et al. make a significant contribution to understanding the areas of the brain used for facial emotion processing in individuals with ASD. These researchers also provide some insightful speculations about the consequences of these differences.

Bal, E., Harden, E., Lamb, D., Van Hecke, A. V., Denver, J. W., & Porges, S. W. (2010). Emotion recognition in children with autism spectrum disorders: Relations to eye gaze and

autonomic state. *Journal of Autism and Developmental Disorders*, 40(3), 358-370. doi: 10.1007/s10803-009-0884-3

These authors list common impairments in social interaction expressed by children with autism spectrum disorders (ASD), including limited use of nonverbal behaviors such as eye gaze and facial expressions, and a lack of emotional and social exchange. A better understanding of these difficulties, particularly those which deal with emotion, is needed in order to facilitate improved social interaction for these children. Accurate facial recognition and interpretation allows individuals to decide when to make acceptable verbal statements and when to withdraw in interpersonal interactions. In addition, the ability to recognize and label emotions is a key predictor in children's social competence. However, findings from studies which investigate emotion recognition in children with ASD have been inconsistent due to differences in methodology. This study aims to fill in gaps from previous research by matching groups based on IQ, using dynamic stimuli, implementing a wide range of emotions, and using a standard measure. The authors also monitor eye gaze patterns and visual attention during the study.

In this study, 33 children with ASD or PDD-NOS and 45 typically developing children (control group) were exposed to Dynamic Affect Recognition Evaluation presentation of emotional expressions. The photos included morphed images from neutral expressions moving to one of the six target emotions. Electromyography (EMG) and electrocardiogram (ECG) electrodes were applied and an eye-tracking system was put in place for each child. In the first phase of the trials, the videos were presented in a random order to collect facial EMG and eye-tracking data. During phases 2 and 3, children were asked to press a button to identify which of the six emotion labels best represented the morphing video shown. Severity of symptoms, heart rate, eye gaze, accuracy of emotion recognition, and latency to recognition were collected and analyzed separately. Data were analyzed with a repeated measures ANOVA.

Results of this study revealed that group differences were only significant on the emotion of *anger*, but the group with ASD displayed more errors overall than the control group. Latency measures revealed that the group with ASD was consistently slower than the control group in identifying emotions. Eye gaze analysis showed that children with ASD were more likely to look at the mouth and "off" regions than the eye region when compared to the control group. Symptom severity correlation measures showed that children with lower communication scores made more errors in emotion recognition.

Relevance to current work: This study supports the notion presented in the current study that children with social communication impairment tend to experience difficulty with emotion recognition compared to typically developing peers. In addition, this study supports the current study in explaining that children with these deficits are not unable to identify emotion, but that the process is slower and more effortful.

Barbaro, J., & Dissanayake, C. (2012). Early markers of autism spectrum disorders in infants and toddlers prospectively identified in the social attention and communication study. *Autism*, 17, 64-86. doi: 10.1177/1362361312442597

Parental report and videotape studies have supported the consensus that early signs of autism spectrum disorders (ASD) are deficits in social attention and communication, including abnormal eye-contact and decreased joint attention skills. Barbaro and Dissanayake employed a

Social Attention and Communication Study to survey early markers of ASD in a community setting. The authors searched for markers emerging at twelve, eighteen, and twenty-four months of age. 20,770 children were monitored by nurses for signs of ASD from eight to 24 months of age. Children who were reported to exhibit these signs were referred for developmental and behavioral assessments. The authors focused on 110 “at risk” children who participated in these assessments. The children were compared and tested to determine the most “discriminating and predictive” early markers at each of the age milestones. At twelve months, the researchers determined the following markers were significant areas of deficit: *pointing*, *waving*, *imitation*, *eye contact*, and *response to name*. At eighteen months, deficits in *pointing* and *eye contact* continued to be significant, as well as deficits in *showing*. “Classic autism” was distinguished (separated from “broader autism”) at this phase by noted deficits in *social smile*, *response to name*, *follows point*, *uses 5-10 words* and *understands words*. At twenty-four months, deficits in *pointing*, *eye contact*, and *showing* continued to be significant markers, as well as *pretend play* and *waving*. To identify classic autism at this stage, the researchers noted deficits in *follows simple commands*, *follows point*, *social smile*, and *response to name*. The researchers concluded that key markers of ASD differed across age groups, and that diagnostic tools should be adjusted accordingly.

Relevance to current work: Social development begins at a very early age. Barbaro and Dissanayake argue that joint attention and eye-gaze patterns are markers of ASD in very young infants. These deficits play a role in later social communication deficits. These findings are noted in the Introduction of the current study to provide speculation as to why children with ASD may be hindered in the development of emotional intelligence.

Baron-Cohen, S., Ring, H. A., Bullmore, E. T., Wheelwright, S., Ashwin, C., & Williams, S. C. R. (2000). The amygdala theory of autism. *Neuroscience and Behavioural Reviews*, 24, 355-364.

Baron-Cohen et al. provide a definition of social intelligence and describe how social intelligence is distinct from general intelligence. Then, the authors provide evidence for a neural basis of social intelligence. Animal lesion studies show that social intelligence relies on three regions: the amygdala, the orbito-frontal cortex (OFC) and the superior temporal sulcus and gyrus (STG). These components comprise the “social brain.” This paper focuses solely on the amygdala.

The paper describes in detail the construction, location, and function of the amygdala. The amygdala is composed of 13 nuclei in the medial temporal lobe. The basolateral (BL) nuclei group activates to “faces and actions of others.” Studies also show that the amygdala is an active participant in emotion processing. Electrical studies with animals show that when the amygdala is stimulated, the animal is attentive and reacts emotionally (defensive, fight or flight responsiveness). In addition, animals with bilateral amygdala destruction are described as “tame and placid.” Primate amygdala lesions cause social isolation and withdrawn behavior.

Following the description of primate lesions, the paper gives six lines of evidence for amygdala involvement in autism spectrum disorder: 1) Post-mortem microscopic examination showed increased cell density (pathology) in the amygdala, 2) Amygdala lesions in monkeys show some symptoms similar to autism, 3) Humans with amygdala lesions show symptoms of “acquired autism,” 4) Cases of tuberous sclerosis occur with autism when there is a hematoma in the temporal lobe, 5) Reduced amygdala volume has been reported with autism, and 6)

Functional neuroimaging with autism patients shows reduced temporal lobe blood flow and reduced activation of the amygdala during mentalizing tasks. The recent fMRI study for evidence 6) is then described in detail. In the study, six subjects with autism were matched with 12 typical controls. Participants identified the gender and then inferred social information from facial stimuli showing eyes only. Both adults with high-functioning autism and parents of children with autism exhibited difficulty on the second task. Functional MRI scanning and ANOVA analysis determined that participants with autism showed less activation in frontal regions and no activation in the amygdala during the second task. The autism group seemed to process more heavily in the temporal lobe structures responsible for “verbally labeling complex visual stimuli and processing faces and eyes”; this method is suggested to be compensatory for lack of amygdala activation.

Relevance to current work: The Baron-Cohen paper outlines the function of the amygdala and related autism studies. The researchers provide a wide base for evidence of “social brain” deficits in autism spectrum disorders and specifically mention an emotion task (face processing).

Bartak, L., Rutter, M., & Cox, A. (1975). Comparative study of infantile autism and specific developmental receptive language disorder. *British Journal of Psychiatry*, 126, 127-145.

The authors sought to determine the cognitive abilities required for the development of infantile autism to be observed. Participants included forty-seven males between the ages of 4;6 and 9;11 with a nonverbal IQ of no less than 70. All participants presented with disordered language comprehension from birth until the time of the study. Nineteen participants were classified with infantile autism characterized by failure to develop social relationships and ritualistic or compulsive behaviors. Twenty-three children presented with developmental language disorder and were termed “dysphasic.” Five children presenting with some features of autism, but without typical diagnostic symptoms, were placed in a “mixed” group. Each participant was assessed for verbal and nonverbal intelligence, and understanding and expression of spoken language. A recording of spontaneous speech was obtained for each participant. Reading assessments were given to determine educational level and supplement language assessments. Standardized play periods were observed and related checklists for social and autistic behaviors were completed. Parents provided further information regarding case history and individualized communication. Based on the assessments, “dysphasic” children showed a higher rate of hearing impairment. Both “dysphasic” and “autistic” groups demonstrated average intelligence, but reduced receptive language ability was recorded for both groups. The “autistic” group showed greater deficiency in language development as measured in several modalities. Comparison between groups also showed relatively few nonlinguistic differences. The authors reported that the results of this study demonstrate that a child with language disorder did not necessarily present with infantile autism, a child with autism most likely presented with language disorder. In other words, developmental disorders of language comprehension were not sufficient in isolation to lead to diagnosis of autism.

Relevance to current work: This study supports the overlap of symptoms between children diagnosed with language disorders and autism spectrum disorders. Children diagnosed with both language disorders and autism spectrum disorders may present with language learning deficiency and social communication disorders. The results provide support for the mixed inclusion of ASD and LI participants in the current study.

Batty, M., Meaux, E., Wittmeyer, K., Roge, B., & Taylor, M. J. (2011). Early processing of emotional faces in children with autism: An event-related potential study. *Journal of Experimental Child Psychology*, 109(4), 430-444.

Batty et al. suggest that although individuals with autism express emotion—enthusiasm, motivation, excitement, and dissatisfaction—these emotions may not be understood by others because of a lack of adherence to social norms. The researchers also mention differences in facial processing by individuals with autism spectrum disorders (ASD), including “atypical visual exploration of faces” and a focus on the lower portion of the face instead of the eyes. Interestingly, individuals with autism are not hindered on facial recognition tasks when the faces are presented upside down, whereas typical individuals show difficulty with this modification. Even with these findings, recent studies show that impairments in facial processing in individuals with ASD may not be as severe as initially assumed, but could be due to visual abnormalities. In order to investigate this hypothesis, Batty et al. explored early visual components (P1) and visuo-social components of facial processing (N170) in ASD. Fifteen children with ASD were compared to two control groups, one of similar age and the other of matched verbal age. Participants completed both an event-related potential (ERP) task and a behavior task in the same sitting. After a brief training task to ensure the children could maintain attention to stimuli, ERPs were recorded from 30 active electrodes in an electrode cap. P1 and N170 activation results showed a significant delay in children with autism compared with age-matched controls. Controls also showed a “P1 latency effect.” Group analysis also showed differences in latency of ERP activations between the groups. Age effects from P1 and N170 suggest a maturation of emotional processes throughout childhood that may be delayed (not deficient) in children with ASD (activation was more comparable to verbal age-matched peers). Batty et al. speculate that given these results, face processing difficulties in children with ASD could be influenced by early perceptual patterns and consequent visual feedback areas, along with holistic processing—a “ripple effect.”

Relevance to current work: Batty et al. present research suggesting that individuals with ASD are not deficient in facial and emotion processing, but simply delayed because of early differences in perceptual processing. This research also supports with the notion that individuals with ASD are more comparable to verbal age-matched peers in facial recognition tasks than chronological age-matched peers.

Bedrosian, J. L. & Willis, T. L. (1987). Effects of treatment on the topic performance of a school-age child. *Language, Speech, and Hearing Services in Schools*, 18, 158-167. doi: 0161-1461/87/1802-0158\$01.00/0

Topics are essential components in the regulation and sequence of conversation. Topics assist in the development of interpersonal relationships and allow communication of ideas and feelings from one person to another. Children with language disorders may struggle to develop the listening and comprehension ability required to effectively manage topics of conversation. This study involved a five-year-old male child enrolled in mainstream kindergarten. The participant was assessed with the following battery of instruments: Piagetian cognitive assessment (Gill, 1979), the Processing Word and Sentence Structure and Oral Directions subtests from the *Clinical Evaluation of Language Functions* (CELF; Semel & Wiig, 1980), and

the *Systematic Analysis of Language Transcripts* (SALT; Miller & Chapman, 1983). A language sample was obtained and analyzed for mean length of utterance (MLU), type token ratio (TTR) and grammatical morphemes. Topic performance was analyzed for conversations between the child and mother and child and clinician. It was determined that the majority of the child's topic initiations related to the present context. The child participated in a multiple-baseline intervention design involving two thirty-minute sessions per week for six months. Treatment goals included increasing the frequency occurrence of memory-related topic initiations and increasing the frequency occurrence of future-related topic initiations. Instruction, modeling, and feedback were supplied within a clinician-generated communication environment. Data were collected from five-minute probe units at the beginning of each session. Results indicated that the child demonstrated an increase in the variety of topics initiated during treatment sessions and following treatment. MLU and morpheme analyses showed gains in syntactic and morphological abilities. Authors noted that these gains were most likely associated with the pragmatic framework of the intervention which focused on functional communication.

Relevance to current work: This results of this study indicated that children have the potential to make gains from pragmatic intervention in the area of topic initiations. This study combined with other social communication intervention studies show promise for treatment in these areas.

Begeer, S., Terwogt, M. M., Rieffe, C., Stegge, H., Olthof, T., & Koot, H. M. (2010). Understanding emotional transfer in children with autism spectrum disorders. *Autism, 14*(6), 629-640.

Beeger et al. note that children with ASD may interpret and describe emotions in a more superficial and scripted way than their typical peers. Children with ASD may rely more on situational rather than subjective components to develop emotional understanding. The authors present the notion of emotional transfer, which occurs when “the emotional response to an earlier situation affects responses to later situations.” Typically, negative emotions evoke longer lasting effects than positive emotions. The current study investigated the ability of thirty-one children with high-functioning ASD to understand emotional transfer. Eleven participants had a diagnosis of autism and twenty were diagnosed with PDD-NOS. Thirty-one typically developing children also participated in the study. Children were presented with four hypothetical stories, each containing two contrasting events. Results of the examinations show that children in all groups responded that initial situations affected the emotion in subsequent situation, however, differences emerged between the various groups. Children in the typically developing group were more apt to indicate a higher impact of negative than positive initial emotions. Children with ASD did not differentiate between the impact of positive and negative emotions on the subsequent activity. These findings support the supposition that children with ASD rely more on scripts to interpret affect in a given situation and employ a unique “logical quality” to understanding emotion.

Relevance to current study: The intervention program in the current study includes an exploration of picture books. The picture books jump rapidly between valences of emotion, and often an initial experience effects the next emotion shown in the story. The theoretical base of this study explains why children with ASD may have difficulty with this emotional transfer in the picture books and thus require the additional instruction given in the intervention program.

Beilinson, J. S., & Olswang, L. B. (2003). Facilitating peer-group entry in kindergartners with impairments in social communication. *Language, Speech, and Hearing Services in Schools, 34*, 154-166. doi: 0161-1461/03/3402-0154

Three kindergarten children with social communication difficulties participated in an intervention for cooperative play behaviors. Specifically, the program targeted peer-group entry—joining peers in ongoing play. Previous studies show that children with social deficits often have trouble employing entry tactics.

The researchers asked the following questions: Will the intervention increase the children's use of high-risk behaviors and decrease their use of low-risk behaviors? Will the intervention increase the children's use of props during peer-group entry? Will the intervention increase the children's amount of time in cooperative play and decrease the amount of solitary play? The study defines low-risk behaviors as waiting, hovering, or engaging in parallel play, and high-risk behaviors as making a statement or asking a question. During the intervention, clinicians trained the children to use entry strategies when encountering peers in a play situation. Results of the study show that all three children used more high-risk behaviors during the treatment phase and maintained this level throughout the withdrawal phase. Levels of prop use also rose to match those of comparison peers. All of the children also showed an increase in cooperative play.

Relevance to current work: Researchers in this study discovered that giving children a prop facilitates peer-group entry. This inclusion of play materials may influence the outcome of cooperative play. In the current work, the quality of story enactment was largely determined by the children's use of the materials provided. Future research could determine whether a combination of this intervention and the intervention from the current work would support social communication development.

Bishop, D. V. M., Chan, J., Adams, C., Hartley, J., & Weir, F. (2000). Conversational responsiveness in specific language impairment: Evidence of disproportionate pragmatic difficulties in a subset of children. *Development and Psychopathology, 12*, 177-199.

Bishop and colleagues sought to identify the verbal and nonverbal responses of children with pragmatic language impairment (PLI) in a conversational setting. Nine children between the ages of six and eight years old in a group with PLI were compared to nine children with specific language impairment (SLI) and two control groups with nine typically-developing children in each (one matched for language age and the other for chronological age). Each child participated in baseline testing for nonverbal ability as well as receptive and expressive language. During the study, conversational samples were obtained from each participant during an interaction with two unfamiliar women. To encourage discussion, photographs were present for use during the conversations. Each child utterance in the conversational samples was coded for quantity (no response, minimal verbal response, or extended verbal response) and adequacy (adequate response, inadequate response, or pragmatically inappropriate response) based on the immediately preceding adult utterance.

Analysis of the coding data revealed differences in response between the various groups. Children in the group with PLI showed a significantly low rate of nonverbal responses, and significantly high rate of "no response." The group with LI produced a lower rate of adequate responses and a higher rate of pragmatically inappropriate responses compared to the control

groups. Researchers concluded that the likelihood of responding did not change according to age, but the format of response did show significant changes. In general, children with SLI were less responsive. Children in both the SLI and PLI groups produced fewer nonverbal responses than younger, typically developing children.

Relevance to current work: This study emphasizes some of the specific deficits shown by children with LI in conversational settings. These children often do not respond or produce inadequate or inappropriate responses in conversation, which contributes to reduced social communication ability. The information revealed in this study is implemented in the discussion of the range of interactional deficits exhibited by children with LI in the current study.

Bölte, S., Hubl, D., Feineis-Matthews, S., Prvulovic, D., Dierks, T., & Poustka, F. (2006). Facial affect recognition training in autism: Can we animate the fusiform gyrus? *Behavioral Neuroscience*, *120*(1), 211-216. doi:10.1037/0735-7044.120.1.211

Bölte et al. acknowledges that impairment in facial affect recognition is associated with a variety of mental disorders, and that numerous studies have shown evidence that inability to judge facially expressed emotions is consistently present with autism spectrum disorders (ASD).

According to the article, recent evidence from imaging studies shows that individuals with ASD have a hypoactivation of the fusiform gyrus (FG) during face and facial-affect processing. This neuro-electrical difference could contribute to a broader array of social and cognitive differences in the disorder. The study used functional magnetic resonance imaging to investigate whether improvements in emotion recognition, facilitated by a training program, increased FG activation. Ten adult individuals participated in the study; five were randomly assigned to the FEFA training program, and five were assigned to the control group. The mean ages of these two groups were 29.4 and 25.8, respectively. Individuals in the training group received a five-week training of two hours per week. The training included a FEFA computer-based program designed to evaluate and teach emotion recognition using basic facial expressions in seven categories: *happy*, *sad*, *angry*, *surprised*, *disgusted*, *fearful*, and *neutral*. MRI images were compared pre- and post-training on the FEFA face and eyes tests. Results show that participants profited from the training program shown by increased scores (31.6 and 17.6 to 43.0 and 31.2 mean scores) while the control group remained relatively stable (33.6 and 21.4 to 33.0 and 21.4). However, no associated activation changes were observed in the FG, although increased activity occurred in areas of the compensatory facial processing network, such as the medial occipital gyrus and the superior parietal lobule.

Relevance to current work: This study employs a facial recognition program in adults, while the current study's participants are children; however, the efficacy of the two programs are found to be similar. The emotion categories targeted in this study are similar to those targeted in the current study, with the exception of the *neutral* category. The theoretical base of this study may help to explain why participants in the current study are good candidates for a social communication intervention.

Boraston, Z., Blakemore, S. J., Chilvers, R., & Skuse, D. (2007). Impaired sadness recognition is linked to social interaction deficit in autism. *Neuropsychologia*, *45*(7), 1501-1510. doi: 10.1016/j.neuropsychologia.2006.11.010

Boraston et al. cite studies that suggest that autism is now considered a “disorder of brain development.” This supposition is supported by brain imaging studies suggesting structural and functional differences. Several studies have specifically shown emotion recognition problems in ASD (matching facial expression with emotion, labeling facial expressions of emotion, identifying emotional “outliers,” matching prosodic features to pictures, etc.). These findings are supported by functional imagining studies showing reduced activation of the fusiform gyrus when completing socio-emotional tasks when compared to typical controls. In contrast, several inconsistencies exist in research regarding the extent of emotion recognition impairment; these disagreements may be due to the wide range of stimuli, group-type matching, and other differences in methodology. In addition, individuals who may be considered impaired in one study may be considered compensatory strategy users in another. This study evaluates the ability of participants to use different cues in emotion recognition. Two experiments were used; in the first, 11 individuals with autism were age-matched to 11 typically developing controls. Twelve animations involving shapes were designed to evoke a certain emotion (angry, happy, sad, or scared). Two animations were designated for each emotion, and the remaining four animations showed “non-living” movement. Participants were asked to identify whether the shape (triangle) was living, then rate the emotion on a scale from 0 (e.g. not at all angry) to 5 (extremely angry). Participants in the control group scored higher than the group with ASD for three of the four emotions, although both groups exhibited ability to distinguish the correct emotion from the alternatives. The highest difference showed in sadness recognition, with the control participants scoring much higher than the group with ASD. It may be important to note that both the control group and the group with ASD labeled sad animations as “living” in fewer cases than other emotion animations. Scores on this experiment were compared to scores on social communication skills rating scales, and a correlation existed between level of impairment and reduced sadness recognition.

The second experiment used the same participants and 60 black and white photographs showing facial affect. Participants viewed each photo for an unlimited time and identified the emotion from six listed options. Results for this second task show that the group with ASD scored “slightly lower” than the control group for all emotions except disgust, which was equal across the two groups. Correlations for emotion recognition scores and scores on social communication skills rating scales were not significant.

Boraston et al. speculate that the results of the first experiment could be due to abnormalities in processing of visual motion or holistic (“global”) processing, or a failure to identify shapes as “living.” However, results on the second task suggest that these differences are more likely due to a deficit in sadness recognition.

Relevance to current work: This study is the first to identify a sadness-specific emotion impairment in ASD, even if these results may be due to the design of the test stimuli. These noted deficits may impact the results of the current study.

Brinton, B., & Fujiki, M. (2005). Social competence in children with language impairment: Making connections. *Seminars in Speech and Language, 26*(3), 151-159. doi: 10.1055/s- 2005-917120

Brinton and Fujiki draw several conclusions based on an examination of case studies of children with language impairment (LI). The first is that almost all children with language

deficits will experience some form of social difficulty. This social difficulty stems from limitations in social communication. Children with LI demonstrate withdrawal problems and weaknesses in negotiation, and thus experience “negative social outcomes.” Causes of these problems vary from child to child, but may include pragmatic, cognitive, lexical, and syntactic difficulties. The article states that children with LI develop emotional understanding more slowly than typically developing peers, and therefore should receive specific intervention for emotion-based tasks. The authors state that children with LI specifically experience difficulty with situational emotional inference. This claim supports findings of recent studies that children with LI are frequently unaware of how an individual might feel in a given situation, and even have trouble inferring whether an individual would experience a positive or negative emotion. According to the authors, efficient intervention for these children with communication difficulties is based on connection “clusters” that aim to influence several behaviors at once.

Relevance to current work: This article emphasizes the need for emotion-based intervention programs. It also provides insight into why children with communication difficulties may produce fewer emotion-based words than their peers: they are making “emotional inferences” much slower and much less frequently.

Brinton, B., & Fujiki, M. (2011). Emotion talk: Helping caregivers facilitate emotion understanding and emotion regulation. *Topics in Language Disorders, 31*(3), 262-272.

Brinton and Fujiki explain that *emotional intelligence* encompasses a multifaceted range of abilities, including emotion understanding and emotion regulation. Emotion understanding includes an awareness of one’s own emotions and also the emotions of others. Emotion regulation involves the design and expression of emotions to achieve social goals. Particularly emphasized is the notion that any concept of emotion involves a complex collection of processes and strategies, both intrinsic and extrinsic. Brinton and Fujiki state that these processes are essential for successful social functioning, as basic social interaction is driven by emotion. Other factors also influence expression of emotion, such as temperament, cognitive appraisal, and socialization.

Brinton and Fujiki suggest that emotion regulation affects a child’s access to learning. In order to master new concepts, a child must be “well-regulated” emotionally in the academic setting. Emotion regulation can be facilitated by engaging in “emotion talk” with children. However, children with language impairment (LI), autism spectrum disorders (ASD), or developmental delays may experience difficulty with such activities because of comprehensive or expressive language limitations. The article suggests the following strategies: 1) make the language of emotion talk accessible to children; 2) make implicit information explicit; and 3) capitalize on teaching moments where children are most available to learn.

Relevance to current work: Definitions from this research were implemented in the introduction of the current work. Also, this research explains the difficulty with emotion experienced by children with LI and ASD and emphasizes the importance of the emotion intervention program. Strategies from this research were included in the intervention program in the current work. This research implies that the dynamic interaction between emotion regulation and language impairment may provide one explanation for the varied results of the current study.

Brinton B. & Fujiki, M. (2012). Social and affective factors in children with language impairment: Implications for literacy learning C. A. Stone, E. R. Silliman, B. J. Ehren, & K. Apel (Eds.), *Handbook of language and literacy: Development and disorders* (2nd Ed.). New York, NY: Guilford.

Brinton and Fujiki provide a succinct summary of the various difficulties faced by children with language impairment (LI). The chapter begins with an introduction of a case study of a 4-year-old child with LI then follows the child through adulthood while citing numerous studies investigating the characteristics of children with similar impairment.

The authors explain that there is a complex link between LI and social and emotional behavior, since social interaction involves both oral and written language. Not all children with LI experience social difficulties, but the prevalence is significant enough to merit extensive research on these topics. Since language ability and socioemotional functioning interact in development, it is difficult to distinguish cause and effect in this research. Furthermore, this complex interaction necessitates intervention not only for linguistic abilities in children with social communication impairment, but also management of social and emotional deficits.

As stated previously, Brinton and Fujiki cite many studies that investigate the social interaction of children with LI. They explain that children with LI have difficulty entering ongoing play and maintaining a niche during peer play. Children with LI may also show less maturity in joint decision-making when compared to typical peers. During interaction, children LI may be less sensitive to the social bids of otherwise and consequently are ignored themselves. In social interaction, children with LI have been shown to exhibit fewer prosocial strategies. Investigation also shows that boys with LI may be involved in more conflicts categorized by researchers as “aberrant.” Many children with LI show higher levels of reticence than typical peers and experience higher levels of victimization. Longitudinal studies show that many of these observed difficulties continue into adolescence and adulthood. Although older individuals with LI did not differ from peers in the number married or with a partner, many held jobs of lower SES or fewer opportunities for advancement.

Individuals with LI are much more likely to experience socio-emotional difficulties such as depression and low self-esteem. Children with social communication impairment may have reduced ability to understand, express, and manage emotions in a manner that supports typical development. Children with LI may have difficulty with any one or combination of the factors involved in emotional intelligence, including perceiving, understanding, and regulating emotion. The authors explain that the social and emotional deficits observed in children with LI have concerning implications for the acquisition of literacy skills. Since literacy emerges in the context of social transactions, children with LI may have difficulty accessing and enjoying traditional literacy events. Children with LI may not enjoy book sharing or participate fully in classroom literacy activities. These factors, along with others, may contribute to reduced academic success for these individuals.

Relevance to current work: This chapter highlights several social communication deficits observed in some children with LI and the effects of these deficits in social and academic contexts over an extended period of time. In particular, this chapter emphasizes emotional intelligence as a key affected area in this disorder. The current study evaluates an intervention program designed to improve the emotional intelligence of participants and thus improve the social and academic outcome for these children in this domain.

Brinton, B., Fujiki, M., & Powell, J. M. (1997). The ability of children with language impairment to manipulate topic in a structured task. *Language, Speech and Hearing Services in Schools, 28*, 3-11.

Recent research has proposed that children with language impairment (LI) may experience difficulty with pragmatic tasks. The purpose of this study was to investigate the ability of children with specific language impairment (SLI) to maintain and manipulate a given topic. In this study, ten children with SLI were compared to ten children matched for chronological age and ten children matched for language functioning. Each participant engaged in an activity during which an adult introduced a topic and the child was expected to respond to the given topic. Two types of topics were introduced in each interaction: one involving verbal introduction of an object, and one involving verbal introduction of an event. Responses were recorded and analyzed for appropriateness. Results indicate that children in all groups produced utterances after the topic introductions. However, the children with SLI were more likely to produce inappropriate utterances than the children in either of the matched groups. When compared with their peers, children with SLI showed more difficulty maintaining a topic presented by an adult.

Relevance to current work: This study shows that social communication difficulties experienced by children with LI affect their ability to navigate conversations. Likewise, the inability to understand a facial expression or the intent behind an emotional exchange has a negative effect on the ability to understand a social interaction and ultimately build relationships. Both this study and the current study sought to evaluate the pragmatic abilities of children with LI and determine ways of improving intervention for these children.

Brinton, B., Fujiki, M., Spencer, J. C., & Robinson, L. A. (1997). The ability of children with specific language impairment to access and participate in an ongoing interaction. *Journal of Speech, Language, and Hearing Research, 40*(5), 1011-1025. doi: 1092-4388/97/4005-1011

The purpose of this study was to examine the access and participation abilities of children with specific language impairment (SLI) in peer conversation. The authors evaluated the ability of the children to access ongoing conversation as well as the nonverbal and verbal collaboration after access. Fifty-four children between the ages of 5 and 12 were included in the study. Eighteen target children included six children with SLI, six children matched to the children with SLI for chronological age, and six children matched to the SLI children for language scores. Each of these three groups included three boys and three girls. The remainder of the participants were typically developing children selected for grade and gender match. During each trial, two typically developing children were introduced and encouraged to play together with provided toys. After a play period, one target child was brought and introduced to the two play partners. The clinician then left the interaction until twenty minutes had elapsed, after which the interaction ended. Each interaction was recorded, transcribed, and analyzed. The point of access was determined when the target child took a verbal or nonverbal turn that was accepted by one or both typically developing play partners. Bids for access that were considered successful were categorized into three groups: contingent comments, facilitating comments or actions regarding extension of the play the subject initiated, and compliant responses to requests for information and action. After the access point, samples were coded in 15-second intervals for behaviors

observed from the target child, including hovering, sitting down with the other children, individual play at or away from the table, collaborative play, or other. Results indicated that 16 of the 18 target children successfully entered the conversation. The two children who did not gain access were in the group with SLI. An additional child with SLI who accessed the conversation only engaged for two minutes with partners, and never sat at the table with the partners. Overall, participants with SLI were observed to be slower to access conversation and produce fewer conversational utterances than typically developing peers.

Relevance to current work: This study indicated that children with SLI experienced difficulty accessing peer interactions and contributed less to interactions than typically developing children. These observations contribute to the concerning nature of social communication deficits in children with SLI.

Brinton, B., Spackman, M. P., Fujiki, M., & Ricks, J. (2007). What should Chris say? The ability of children with specific language impairment to recognize the need to dissemble emotions in social situations. *Journal of Speech, Language, and Hearing Research*, 50, 798-811. doi: 1092-4388/07/5003-0798

Children with communication difficulties often demonstrate deficient social competence. Emotional competence is a key component of social competence, including the ability to dissemble (or hide) emotions that are not socially acceptable to express. This study examined whether children with specific language impairment (SLI) were able to appropriately dissemble emotions according to the demands of social display rules.

The study compared 19 children with SLI to 19 typical gender and chronologically matched peers. Clinicians designed hypothetical scenarios in which a main character encountered a situation that would result in a distinguishable emotion (happiness, sadness, anger, disgust, or fear). The participants listened to the scenarios and then answered a series of questions: 1) comprehension, 2) emotion, 3) dissemblance, and 4) display rule. The clinicians scored the participants on dissemblance and display of emotion. The following significant differences were found: 1) The typical children chose to dissemble (rather than to display) emotions more frequently than the children with SLI. 2) "Fear" situations elicited the least amount of dissemblance, while "sad" situations elicited the most amount of dissemblance, and 3) Females respondents stated display rules more frequently than male respondents. This study supports the concepts that emotional understanding and social understanding are intertwined, and a combination of difficulties in these areas leads to compromised social functioning.

Relevance to current work: This study examines one component of emotional competence for children with LI, the ability to dissemble emotions when it is appropriate to do so. These children performed more poorly than typical children, showing that on this measure, emotional competence was reduced in children with LI. This study supports the need for effective intervention for these children to address deficits in emotional competence.

Castelli, F. (2005). Understanding emotions from standardized facial expressions in autism and normal development. *Autism*, 9(4), 428-449. doi: 10.1177/1362361305056082

Since 1943, researchers have investigated social and affective abilities of individuals with autism. Theories range from general affective deficits to selective emotion recognition deficits. Theory of mind tasks play a definite role in emotion studies. Researchers have long debated whether children show deficits in emotion perception compared to typical controls. Some speculate deficits in emotion perception may be due to general difficulties with executive functioning and processing. Castelli also mentions recent research using neuroimaging, particularly studies regarding autism and the amygdala. In sum, adults with high-functioning autism have shown reduced activation of the inferior frontal gyrus and little to no activation of the amygdala during “understanding of complex mental states.” However, adults with autism perform well on simple emotion-recognition tasks. Even with this ability, they may not be able to retrieve complex or subtle social cues from only facial expression. A few recent studies cited by Castelli found that children with autism have “no difficulties” recognizing simple and complex emotions. Clearly this area of research has produced some conflicting data, and this study seeks to clarify inconsistencies.

The Castelli study includes the following experiments: 1) An investigation of ability to perceptually discriminate between basic emotions. 2-3) Semantic tasks (selecting an emotion from a wide range of facial expressions). The author’s hypothesis predicted that *happiness* would be most easily identified and *surprise/fear* and *anger/disgust* would be most frequently confused. A group of twenty children diagnosed with either autism or Asperger syndrome was compared to a group of twenty typical children. Results for experiments 1 and 2 revealed, as predicted, that scores on *happiness* were highest, while *fear* and *surprise* drew the lowest scores. In experiment 3, which included varying levels of intensity in emotion expression, all children hit a ceiling level of performance identifying *happiness* with children with autism performing similarly to controls on other emotions. Castelli concludes that in general, children in the group with autism performed similarly to typical controls in all three experiments. Since this directly contradicts previous studies stating that children with autism spectrum disorders have difficulty with emotion recognition tasks, Castelli provides some speculation as to why the results were obtained. Castelli explains that the participants in this study presented with a higher cognitive age than in some comparison studies. Also, the materials used in this study (computer “morphed” photographs) were different than other studies which have used drawings of emotion expressions. Castelli also speculates that the participants with autism may have used “compensatory strategies” to “bypass” emotion recognition impairment. It is also possible that these children can recognize emotion expressions, but connecting the emotion recognition to social implications of the emotion may be a more challenging problem. Consequently, Castelli recommends further research investigate very young children and focus on controlling for deficits in executive functioning which may affect results.

Relevance to current work: A baseline and follow-up measure used in the current research project were similar to the emotion-recognition task used in the Castelli study task. Following the recommendations of Castelli, the current study recruited younger children, but compared baseline and follow-up measurements instead of using a control group. The current study found similar results to the Castelli study, including the children’s proficiency with the *happiness* and lower performance on *fear*, *surprise*, and *disgust*.

Celani, G., Battacchi, M. W., & Arcidiacono, L. (1999). The understanding of the emotional meaning of facial expressions in people with autism. *Journal of Autism and Developmental Disorders*, 29(1), 57-66.

At the time of this study, results from sorting, matching, and cross-modal experimental designs had yielded contrasting results in experiments with facial emotion recognition and autism. Performance has been found to be more similar on these tasks between participants and controls matched for verbal mental age. However, when participants with autism spectrum disorders (ASD) are matched for verbal mental age, their perceptual and visual-spatial capacities far outreach controls'. Some findings suggest an "unusual, emotion unrelated, face recognition strategy" employed by individuals with autism. According to emotional processing theories, these strategies could include an atypical reliance on perceptual strategies over holistic, right-hemisphere processing.

In this study, participants with ASD were compared to a group with Down syndrome and a typically developing control group. Controls were matched for verbal mental age. All subjects took part in delayed-matching and sorting-by-preference tasks. In the first task, participants identified emotions on faces. During the second, participants were given a choice (one or the other) of preferred stimuli, which included facial expressions and pleasant and unpleasant scenery. On the first task, participants with ASD scored significantly lower than both other groups. On the second task, participants in the group with Down syndrome and typical controls showed significantly greater preference for happy faces than the participants with ASD, whose responses did not differ from chance level. These results show a reduced ability in individuals with ASD to recognize happy and sad facial expressions. Two alternate explanations are given: 1) The responses of the group with autism are similar to those expected with a random response pattern; differences between groups could be due to lack of attention or lack of compliance with the instructions (thus the results would not be representational of emotional processing ability), and 2) Short-term visual memory may have played a role in correct identification, although literature does not show memory impairments in ASD.

Relevance to current work: Although an early study in emotion and ASD, this work suggests an impairment in facial emotion recognition, a main target of the intervention program in the current study. This study also emphasizes the importance of maintained attention on tasks involving emotion for individuals with ASD.

Cloward, R. (2012). *The milk jug project: Expression of emotion in children with language impairment and autism spectrum disorder* (Unpublished honor's thesis). Brigham Young University, Provo, Utah.

The purpose of this study was to investigate triadic peer activities prior to and after a social communication intervention program targeting emotion-based words. The study highlighted how target behaviors of the intervention program were variable in generalization to social situations. Six participants, ages 5;1 to 6;10 participated in the study. Four participants were diagnosed with language impairment (LI), and two participants were diagnosed with autism spectrum disorders (ASD). The intervention program consisted of twenty individualized treatment sessions based on emotion word usage for a wordless picture-book series, Mercer Mayer's *A Boy, A Dog, and A Frog* (1967). Each intervention session consisted of twenty

minutes of story enactment and other supporting activities with a graduate clinician. To determine the efficacy of the intervention program, baseline and follow-up measures were obtained for each participant. One such measure consisted of a triadic peer interaction. Each participant was placed with two age- and gender-matched peers for an art project with the objective of creating a milk-jug animal. The project was completed in one pre-intervention session and one post-intervention session for each of the participants. Each of the milk jug activity sessions were transcribed and coded for the use of emotion-based words and overall utterance counts for each of the participants. Utterance counts were used to determine the percentage of conversational remarks used by the participants compared to peers. Results showed that although individual performance proved variable, four of the six participants improved on one or both of these measures. Two children did not demonstrate use of emotion-based words in the pre- or post-intervention activity sessions. Two children improved in the percentage of conversational remarks generated compared to peers. Overall, results indicated that the heterogeneous nature of social communication deficits demonstrated by the participants contributed to mixed success with generalization of the intervention targets.

Relevance to current work: This study is a portion of the larger study which also encompasses the current work. The participants and intervention program evaluated in this study are the same as those evaluated in the current work, although different aspects of the program are investigated.

Dapretto, M., Davies, M. S., Pfeifer, J. H., Scott, A. A., Sigman, M., Bookheimer, S.Y. & Iacoboni, M. (2006). Understanding emotions in others: Mirror neuron dysfunction in children with autism spectrum disorders. *Nature Neuroscience*, 9, 28-30.

As part of the research that investigates neurological functioning in individuals with autism spectrum disorders (ASD), Dapretto et al. examined brain activity during emotion recognition and imitation tasks. This study specifically focuses on the action of mirror neurons. The first mirror neurons were discovered in the ventral premotor cortex, and they fire while observing actions performed by others. Evidence suggests that mirror neurons in the limbic system assist in interpreting the emotions of others. Dapretto et al. recruited ten children with ASD and compared them to ten typically developing children. Participants were exposed to 80 emotional faces communicating anger, fear, happiness, neutrality or sadness. A two-second viewing period included either imitation or simple observation. Results indicate that the activation patterns in typically developing children during the imitation task were similar to adult activations. Participants with ASD also showed similar activation in the premotor and motor regions, amygdala, and visual cortices, but no activity in the mirror area in the pars opercularis. A closer look showed typical children with greater activation in the insular and periamygdaloid regions, ventral striatum and thalamus, while children with ASD had greater activity in left anterior parietal and right visual association areas. No differences were found in the fusiform gyrus. Dapretto et al. acknowledges the relevance of eye-gaze, but found no indication of a positive relationship between mirror neuron activity and eye-gaze time and therefore assumed no impact from this element.

Further investigation questioned whether severity of diagnosis and symptoms made a difference in activation. A negative correlation was found between activity in the pars opercularis and children's scores on social subscales. However, a confusion arises between the

report of “no activity in the mirror area” and this negative correlation. Overall, the study suggests that children with ASD employ alternative strategies—involving increased visual and motor components—when interpreting emotions.

Relevance to current work: This study contributes to the assumption that children with ASD use compensatory strategies to interpret emotions. This notion is discussed in the Introduction of the current work.

Dollaghan, C., & Kaston, N. (1986). A comprehension monitoring program for language-impaired children. *The Journal of Speech and Hearing Disorders*, 51(3), 264-271.

This study was based on a novel social communication intervention designed to increase awareness of comprehension deficits and the production of clarification requests in children with language impairment (LI). Four first-grade participants with LI were chosen on the basis of limited ability to monitor comprehension of spoken messages in a classroom setting. Each child received four or five weeks of individual intervention sessions. Sessions were held three times per week and lasted twenty minutes each. The participants were taught to identify, label, and demonstrate active listening behaviors. They were instructed in recognition of inadequacies in signal delivery (such as interference from background noise). In the middle phase of treatment, the children were trained in recognition of messages with inadequate content and taught to react accordingly. Finally, children were instructed as to the appropriate method of response to messages that were not comprehended due to unfamiliar vocabulary, excessive complexity, or length. The complexity of the stimuli gradually increased over the course of the intervention. Responses were evaluated on the presence or absence of a “functional verbal query,” or a direct or indirect request for additional information about the stimulus. Results show that each participant demonstrated a rapid increase in production of functional verbal queries at the onset of the treatment program. Maintenance of this behavior was also observed during post-treatment evaluation.

Relevance to current work: This study represents one of the early intervention studies examining an aspect of social communication. The current work also evaluates a social communication intervention, although differing outcome objectives and methods of analysis are used. This study contributes to the promising results shown by social communication programs and reaffirms the need for more efficacy studies in future research.

Dykstra, B. A. B., Watson, L. R., Crais, E. R., & Baranek, G. T. (2012). The impact of the advancing social-communication and play (ASAP) intervention on preschoolers with autism spectrum disorder. *Autism*, 16, 27-44. doi: 10.1177/1362361311408933.

The purpose of this study was to evaluate an intervention based on social communication and play skills entitled Advancing Social-communication And Play (ASAP) for preschool children with autism spectrum disorder (ASD). Since the number of preschoolers entering kindergarten with diagnoses of ASD is increasing, interventions are needed that target deficits in early social communication and play behavior observed with this disorder. The researchers posed the following questions: 1) Does implementation of ASAP in a group setting improve social communication and play skills in preschool children with ASD? and 2) Does implementation of

ASAP in both a one-to-one and group setting result in further improvements in social communication and play skills? A multiple-baseline across-participant, single-case design was implemented to investigate these areas. Three participants, two female and one male, were selected for the study. Demographic, diagnostic, and treatment history information was obtained for each participant. The ASAP intervention was then implemented for each of the participants. The intervention package included 20 objectives in the categories of social interaction, requesting, and joint attention based on developmental hierarchies as well as 21 objectives in the categories of exploratory, relational, functional, and symbolic play. The children were assessed for current level of functioning and appropriate starting point for intervention within these objectives. One-to-one instruction was conducted for at least 40 minutes per week and group therapy was provided for at least 40-75 minutes per week for 19 and 1/2 weeks of staggered implementation. Each participant received at least 11 weeks of therapy. Data were collected for child behavior in the school setting based on a 10-minute partial interval coding system. The behaviors of interest included initiation of social interaction, initiation of behavioral requests, initiation of joint attention, functional play acts, and symbolic play acts. Results indicated that all participants showed some improvement in these social communication and pretend play skills, although one-to-one and group combinations were needed to observe changes.

Relevance to current work: This study provides evidence that therapy involving one-to-one intervention based on social communication can yield positive outcomes for children with ASD. Both this study and the current study use a similar methodological design, with some differences. The Dykstra et al. (2012) study implements intervention for preschool children, while the current study includes school-aged participants.

Faja, S., Aylward, E., Bernier, R., & Dawson, G. (2008). Becoming a face expert: A computerized face-training program for high functioning individuals with autism spectrum disorders. *Developmental Neuropsychology*, 33, 1-24.

A diagnosis of autism spectrum disorder (ASD) is marked by impairments in social communication, including a reduced ability for facial processing. Research has shown that individuals with ASD focus more on distinct features of the face and less on holistic processing. Evidence also shows that individuals with ASD show atypical visual attention patterns to faces. The purpose of this study was to examine the efficacy of a novel training program targeting facial processing. Ten males with ASD, ages 12-32 participated in the program. Five were grouped into a training section, and the remaining five comprised the control group. The two groups were balanced for age, intelligence, diagnostic, and standardized face measures collected at baseline. Each participant in the training group took part in an average of eight training sessions, each lasting 30 minutes to one hour, depending on the level of correct responses. The training sessions consisted of several minutes of explicit rule-based instruction which emphasized configural processing of faces. Participants were encouraged to attend to an entire face. Stimuli were presented for inspection, matching, and practice matching. Matching conditions were matching-cropped or matching-filtered to prevent over-reliance on certain features. Backward-matching comprised an additional practice task.

Results show that all participants with ASD met the criterion for mastery with a novel set of faces within the allotted total therapy time (eight hours). Four of the five participants met this standard on two consecutive measurements. Sensitivity to second-order relational information

was improved in the training group compared to the control group. However, changes in feature versus holistic processing and performance on standardized tests of face memory and recognition were not observed as a result of the program. The authors propose that a combined view of the results shows that training and practice with mechanisms that are not automatically developed in individuals with ASD may improve. It is difficult to determine, though, whether improvements are made to brain function or compensatory mechanisms.

Relevance to current work: This study proposes that training time specifically dedicated to facial processing contributes to increased performance in this category. The current study includes training for identification of facial expressions, but within a story context. Both the Faja et al. (2008) study and the current study share the common goal of improving social communication mechanisms that do not develop automatically.

Ford, J., & Milosky, L. (2003). Inferring emotional reactions in social situations: Differences in children with language impairment. *Journal of Speech, Language, and Hearing Research, 46*(1), 21-30. doi:10.1044/1092-4388(2003/002)

Ford and Milosky claim that children with language impairment (LI) experience difficulty generating inferences from a partner's emotional reactions. The authors argue that this difficulty discerning emotional cues contributes to general social difficulties identified in children with LI. The article references several studies that conclude that children with LI are less accurate than peers at verbally naming emotion words when given facial expressions (Dimitrovsky et al. 1998, Holder and Kirkpatrick 1991). Ford and Milosky also claim that children with LI have difficulty forming causal relationships between unobservable mental states and their corresponding emotions. According to this article, children with LI experience "process overload" because of the complexity of the inference tasks.

Ford and Milosky sought answers to the following questions: 1) Do children with LI have difficulty identifying facial expressions? 2) Can they integrate facial expression knowledge with other verbally and/or visually presented information in order to make a social inference? And 3) Are inferencing difficulties modality-specific? The authors compared two groups of children, 12 with LI and 12 with typically developing language. Clinicians asked the children to identify emotions in the following test situations: 1) facial expressions on picture cards, 2) emotions of characters in a story and 3) basic emotion inferencing tasks.

Results of this study show that all children exhibited equal ability to identify the emotions *happy*, *sad* and *mad* when shown picture flashcards, but *surprised* proved problematic for a few children in both groups. All children tested correctly pointed to facial expression pictures when given an emotion word. However, children with LI had more difficulty than their peers with inference tasks, suggesting limitations in the processing of emotional and social information. Ford and Milosky hypothesize that this struggle with inferencing increases as the complexity of the processing task increases. Also, children with LI made frequent valence errors during the study (confusing positive and negative emotions). These social misjudgments could lead to severe communication difficulty.

Relevance to current work: These findings suggest that the complexity of emotional inference tasks corresponds to either 1) an avoidance of emotional-based communication in children with LI, or 2) an inefficient or improper use of emotional-based communication in children with LI.

Fujiki, M., Brinton, B., & Clarke, D. (2002). Emotion regulation in children with specific language impairment. *Language, Speech, and Hearing Services in Schools, 33*, 102-111.

Several studies report that children with language impairment (LI) experience social difficulties throughout the elementary grades. Although it would be simple to assume that these social difficulties stem directly from impaired language skills, the relationship is quite a bit more complex. According to Fujiki et al., Language scores from standardized tests do not always predict level of social performance, but more factors contribute to social competence. Fujiki et al. suggests that emotion regulation is one such factor that shapes social performance. Because emotion regulation is variable among children with LI, it may contribute to or hinder social communication. Emotion regulation is not isolated from other behaviors; rather, it is interwoven with emotion understanding and emotion expression. It is important to note that a child must first gain awareness of an emotion before it can be regulated. These processes develop as children mature linguistically; the development of emotion regulation and the development of language occur parallel to each other.

Fujiki et al. asked the following questions in this study: Do children with SLI (specific language impairment) differ from their typically developing peers in their ability to regulate emotion? Is the ability of children with SLI and their typical peers to regulate emotion influenced by gender? Is the ability of children with SLI and their typical peers to regulate emotion influenced by chronological age? During the study, teachers gave 41 children with SLI and 41 typically developing children ratings on the Emotion Regulation Checklist (ERC). Results show that the children with SLI scored lower on both the lability/negativity and emotion regulation components of the ERC. Boys with SLI scored lower on the emotion regulation subscale when compared with girls with SLI and typically developing children. Scores for both younger and older children with SLI were surprisingly similar for the measure of expressive language ability ("Can say when s/he is feeling sad, angry or mad, fearful or afraid").

Relevance to current work: This study provides evidence as to why children with language impairment may express emotion words less frequently than their typical peers. The expressive language measure is particularly relevant; a reduction in the ability to state a particular emotion corresponds to the reduction in emotion-based words used by children with LI. Also, this study suggests that male children with SLI experience more difficulty with emotion understanding than female children with SLI, and would therefore exhibit different results than their female counterparts in the larger study encompassing the current work.

Fujiki, M., Spackman, M. P., Brinton, B., & Illig, T. (2008). Ability of children with language impairment to understand emotion conveyed by prosody in a narrative passage. *International Journal of Language & Communication Disorders, 43*(3), 330-345. doi: 10.1080/13682820701507377

Many recent studies have examined the connections between deficits in social communication and emotion understanding in children with language impairment (LI), but this study pinpointed the ability of these children to understand emotion through prosody when presented with a narrative. In the study, nineteen children with LI and nineteen of their typical peers listened to narrative passages presented by actors reading with various expressions of

prosodic emotion, including happiness, anger, sadness, and fear. The children then indicated which emotion the speaker conveyed. The results show that children with LI were not incapable of stating the correct emotion, but they performed poorer than their typical peers. The children with LI were especially prone to confuse negative emotions such as fear and sadness. Given this outcome, the authors explain that these children did not struggle overall with prosody, but struggled to recognize specific prosodic cues marking the presence of certain emotions. It may be that simultaneous processing of language comprehension and emotion understanding during the narrative proved too complex for these children to identify the correct emotion 100% of the time. These findings are unique insights into the social world of children with LI. Although it is difficult to extend these results to a naturalistic context, it is logical that an inability to distinguish between emotions such as fear and sadness would lead to significant communication breakdowns.

Relevance to current study: Prosody is an important component of emotion-understanding. Difficulties with any of the components of emotion-understanding could lead a child to inappropriately express emotion or be reluctant to express ideas using emotion-based words.

Gepner, B., Deruelle, C., & Grynfeldt, S. (2001). Motion and emotion: A novel approach to the study of face processing by young autistic children. *Journal of Autism and Developmental Disorders*, 31(1), 37-45.

Many studies have suggested that a core deficit in facial processing may result in social difficulties experienced by individuals with autism spectrum disorders (ASD). Gepner, Deruelle, & Grynfeldt mention that several studies have disagreed on specific findings, perhaps due to control group construction. Specifically, studies that use verbal mental age-matched peers do not support the idea of a facial emotional processing deficit in children with ASD. The purpose of this study was to examine if motion (simulating a real-life situation) would improvement facial expression recognition performance in children with ASD. A group of 13 children with autism ages 52 to 84 months were compared to 13 typical control children matched for gender and developmental age (21 to 61 months old). Videotaped sequences included depictions of joy, surprise, sadness, and disgust by a female actress. Each facial expression was presented as a still shot, dynamic face, and strobe condition. Participants selected emotion pictures to match the expressions from the videotapes. Testing was completed in familiar environments (day cares, nurseries), and trials were repeated when participants lost attention with the stimulus. Results show scores above chance levels for both groups. The performance of the Group with ASD was “slightly lower” than the average performance of the control group, but condition of presentation yielded no significant effect. The researchers speculate that older participants would perform better than age-matched peers with autism, since chronological age boosted scores more for the control group than the autism group.

Two observations are mentioned by Gepner et al.: 1) The children with autism were noticeably more interested by the experimental set-up and presentation, and 2) The dynamic presentation induced an immediate imitation of facial expressions by several children with autism and some typical controls, and these imitations were not predictive of a correct response. Contrary to the researchers’ hypothesis, the motion condition did not facilitate better emotion recognition in the participants with ASD. The relatively good performance is speculated to be

related to the slowness of facial movements in the stimuli, suggesting that these children can extract information from slowly presented sequences and match the information to a still picture. Design of the control group may have also played a large factor in the results. However, it is still surprising that the children with autism did not perform differently than the control group at identification of the still pictures. Researchers suggest this result may be due to the high level of attention given to the stimuli or possible micro movements that helped to aid discrimination. They conclude by mentioning that general facial processing might be a worthwhile component of early emotion-expression intervention.

Relevance to current work: This study suggests that children with ASD, when intent on stimuli, can perform similarly to verbal and developmental age-matched peers on emotion recognition tasks, especially when given enough time to process cognitively the identification. This study supports the hypothesis in the current work that additional instruction and time will facilitate the emotion recognition of participants with social communication disorders.

Gerber, S., Brice, A., Capone, N., Fujiki, M., & Timler, G. (2012). Language use in social interactions of school-age children with language impairments: An evidence-based systematic review of treatment. *Language, Speech, and Hearing Services in Schools, 43*, 235-249. doi: 10.1044/0161-1461(2011/10-0047)

The authors conducted an Evidence Based Systematic Review (EBSR) of intervention literature for social communication disorders. Five professional speech and language pathology researchers associated with various colleges and universities participated on the review committee. The primary research population investigated by the committee was school-age children with LI. The committee investigated studies written in English in peer-reviewed journals published between 1975 and June 2008. The review specifically included the following eleven treatment areas: positive behavioral support, parent treatment programs, milieu teaching treatment, communication partners treatment, peer mediation, conversation/discourse treatment, pragmatic treatment, social skills training, applied behavior analysis (ABA), narrative/discourse treatment, and responsibility training. Using 22 electronic databases, the authors located eight studies matching the above criteria.

The eight studies found were evaluated for methodological rigor. The authors concluded that all eight studies were considered “exploratory,” and that social communication intervention for children with LI was in an early stage of efficacy development. In particular, based upon this review, intervention with information regarding generalization of treatment targets was largely unavailable.

Relevance to current work: Since this study represents the evaluation of a large body of related research, the methodological considerations mentioned served as a key component for the design of the intervention program examined in the current work. Through an examination of the limited studies available for this topic, this study provided evidence for increased research efforts in this area.

Golan, O. (2010). Enhancing emotion recognition in children with autism spectrum conditions: An intervention using animated vehicles with real emotional faces. *Journal of Autism & Developmental Disorders, 40*(3), 269-279. doi: 10.1007/s10803-009-0862-9

Autism spectrum conditions (ASC) include neurodevelopmental challenges with social-communication and obsessive interests. Typically developing infants gain the ability to recognize facial expressions at around ten weeks of age, but individuals with autism spectrum conditions may have difficulty with even these early behaviors. Golan speculates some reasons for this difference: people with ASC have reduced orientation to faces, which may reduce the amount of mentalistic and emotional information they gather from facial expressions. Perhaps children with ASC do not find facial expressions intrinsically rewarding. Golan agrees with other researchers that these differences may hinder children from becoming “face experts.” For these children, early intervention programs are available to target social communication or aid in the development of compensatory “systemizing” behaviors. The purpose of this study was to evaluate the efficacy of an animated television series, *The Transporters*, which was designed to improve the emotional vocabulary and emotion recognition in children with ASC. The rationale behind the series stems from the theory that children with ASC prefer predictable, rule-based systems. Characters in the series are designed to appeal to this “need for sameness” that is much less prevalent in the social world. The predictably-moving vehicles have actor’s faces that show emotion to encourage attending to expression. Fifteen episodes include five-minute lessons on key emotions: *happy, sad, angry, afraid, disgusted, surprised, excited, tired, unfriendly, kind, sorry, proud, jealous, joking, and ashamed*. Three groups of participants engaged in this study: one group of intervention children with ASC, one control group of children with ASC, and one group of typically developing children. Participants were tested over a four-week period, once before the intervention and once after. Tests included emotional vocabulary and facial-expression-to-socio-emotional-situation matching tasks. Statistical analysis of the results revealed that the intervention group improved from pre to post-intervention on the four tasks tested, while the control groups remained stable. The ASC intervention group performed surprisingly well on “distant generalization tasks,” an elusive area in some intervention programs. Golan suggests that the young age of the participants (3-8 years) made them more inclined to the series’ teaching patterns.

Relevance to current work: Both this study and the current study evaluate social communication intervention programs. Unlike the current study, however, this study focuses on a home-parent intervention which only lasts four weeks. Both programs use human faces to improve generalization of targets. The same “systemizing” theory mentioned in this program is incorporated in the routine of the intervention program in the current study.

Grelotti, D.J., Klin, A.J., Gauthier, I., Skudlarski, P., Cohen, D.J., Gore, J.C., ... Schultz, R. T. (2005). fMRI activation of the fusiform gyrus and amygdala to cartoon characters but not to faces in a boy with autism. *Neuropsychologia*, 43, 373-385.

Grelotti et al. note that individuals with pervasive developmental disorders (PDDs) experience deficits in face perception and hypoactivation of the fusiform face area (FFA). Research has not yet determined whether these impairments are due to a defect in the cortex or a failed development in the FFA. However, general amygdala dysfunction is documented as part of the neuropathology of autism spectrum disorders. Specifically, the amygdala neurons are smaller, packed more densely and have stunted branching patterns. The hypoactivation of the amygdala experienced by these individuals seems to be linked to deficits in emotion perception, especially perception involving facial expressions. Grelotti et al. speculate, along with other

researchers (Pierce & Courchesne, 2000) that in individuals with autism spectrum disorders the amygdala might show a greater response to objects of restrictive and pervasive interest than human faces. This speculation is reasonable because records show increased FFA activation for “objects of expertise”—cars, birds, etc.—in typically developing individuals; those with autism may not have “face” expertise.

In this study, an 11-year-old boy with autism (DD) with a particular interest in Digimon cartoon characters was compared to a typically developing 10-year-old boy (TDC) with an interest in Pokémon. Another 17-year-old boy with autism was also recruited to examine if the results were unique to DD or more generalizable. The participants were observed using functional MRI (fMRI) scanning to examine activation during perceptual discriminations involving the characters. Stimuli were presented in pairs and the participants determined if the pictures were the same or different. Data from these tasks show a number of interesting results. TDC was faster at identification of Pokemon and human faces than DD, but slower with Digimon. DD was faster (and showed higher activation) while individuating Digimon than human faces and common objects. In fact, DD individuated faces and common objects at about the same rate. Neuroimaging showed that DD presented with no FFA activation to unfamiliar faces, but as expected, high activation to Digimon stimuli. Interestingly, these activations occurred in the right lateral FG, the location typically activated for faces in other research studies. Neither TDC nor the other participant with autism showed greater activation to characters than objects or faces. Grelotti et al. speculate two possible causes for these results: 1) The “face modules” in individuals like DD may be damaged similar to those with acquired prosopagnosia, or 2) A lack of experience with faces may underlie the “face processing deficit” and thus cause hypoactivation in the FFA. Both the expertise effects and lack of activity in the FFA for faces with autism are documented by other research projects, but this is possibly the first study to combine these findings with measurements of amygdala activity to suggest that “social interest” is the main precondition for typical development of these brain areas. The remaining question is, “Why are there social motivational impairments among persons with autism?”

Relevance to current work: The intervention in the current study seeks to improve the “face expertise” mentioned in the Grelotti study for the participants with social communication deficits, as well as increase social motivation for emotional intelligence.

Gross, T. F. (2004). The perception of four basic emotions in human and nonhuman faces by children with autism and other developmental disabilities. *Journal of Abnormal Child Psychology*, 32(5), 469-480.

Infants as young as 12 months of age show response to human facial emotion expressed by others, and this ability continues to develop into adulthood. This behavior apparently generalizes to non-human animals and objects. However, persons with autism have been found to have difficulty recognizing and understanding emotions or the significance of emotions. Some studies show that individuals with autism can identify basic emotions, but may not realize the social significance of those emotions. Other studies show that those with autism can recognize basic emotions caused by external factors, but experience more trouble with self-awareness emotions (surprise and embarrassment). Still further studies report a difficulty with negative emotions only. Several explanations for these findings are available. Children with autism may have limited social schema or examine select facial features (rather than the whole face) when

judging affect. Perhaps children are attuned to the emotions of familiar family and friends, but not accustomed to the expression of unfamiliar persons. In order to investigate this hypothesis, this study implemented an experimental method involving facial emotion recognition tasks. Four distinct groups took part in this study: one group of 27 children with autism spectrum disorders, one group of 28 with developmental language disorders, one group of 26 children with intellectual impairment, and a final group of 27 clinical controls. After a training procedure, participants viewed 24 test trials including female human faces, orangutan, or canine faces depicting one of five emotions (happy, sad, angry, surprise, and neutral). The children were asked to point to the photograph representing a specified emotion. Statistical analysis (ANCOVA) reported a significant group effect; children in the autism group recognized fewer emotions than all other groups overall. More detailed analysis showed that the autism group performed similarly to the intellectual impairment group in five conditions, and similar to all groups when identifying human happiness. Those in the autism group also made more errors with the canine and orangutan emotion recognition, confusing anger and happiness and anger and sadness.

A second experiment investigated the attention of children with autism to specific facial features when evaluating affect. The second task included groups of slightly smaller size, and used the same materials, with the alteration of portions of the faces masked. Face options included a view of the upper, lower, or full face in one trial. Results for the second experiment show once again a poorer performance from the autism group. Specifically, children in the control group and group with language disorders performed better when viewing the full face, while children in the group with autism received similar scores for viewing the partial and full face stimuli. The group with autism also performed at chance levels on the upper face-viewing portion. These results signify that the participants with autism attended more to the lower portions of the face, while children in other groups attended to the upper and full face. Researchers speculate this interesting behavior may be due to an overdependence on left-brain, learned cultural rules rather than the early developing emotional system in the right cerebral hemisphere. Development of the emotional system may be hindered by early deficits in attending to and understanding emotional experiences of others.

Relevance to current work: The stories studied in the current study's intervention program include emotion interpretation of non-human characters—the dog, the frog, and the turtle. Clinician's frequently asked questions such as, "How does the dog feel?" or, "How does the turtle feel?" during the intervention sessions. The Gross study suggests that children with autism may have more difficulty identifying emotions on animal faces than on human faces; therefore, these findings are considered in the interpretation of data from the current study.

Grossman, J. (2000). Verbal Bias in Recognition of Facial Emotions in Children with Asperger Syndrome. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, 41(3), 369.

Asperger Syndrome (AS) is often considered as synonymous with high-functioning autism, or a condition characterized by autism-like symptoms without the presence of language or learning delays. Researchers have investigated the possibility that deficits in facial perception may explain social disabilities present in this population, and several studies have considered the ability of individuals with AS to identify and understand emotion shown on faces. In this study, subjects were involved in a complex project over a three-day period. Thirteen individuals, with a mean age of 11;8 participated in the study. A control group matched for chronological age and

verbal IQ also participated in the study. Grossman used photographs from the Ekman (1976) series of photographs showing *happiness, sadness, anger, fear, and surprise*. Participants were asked to first match word to word on a touch-pad for an evaluation of reaction time and ability to follow instructions, then presented pictures and asked to select the word that “best says how the person in the photo is feeling,” with a multiple-choice answer format. In another task, a word was presented in addition to the photograph—either a matching label, mismatched label, or irrelevant word, and the participants were again asked to select the word that best fit the emotion shown in the photograph. Results show that both groups performed poorly on *fear*. On the word task, there were significant group effects, type of word effects, and emotion word effects. The group with AS made significantly more errors when a mismatched label was present with a photograph. Most of these errors (80%) were made when the participant selected the word matching the incorrect label, rather than the emotion shown in the photograph. These findings suggest that children with AS rely more on verbal and logical strategies than subjective visual-affective information to solve socio-emotional tasks.

Relevance to current work: These findings provide evidence for the “compensatory strategy” theory of emotional intelligence in autism spectrum disorders. Although the participants’ diagnosis do not match that of the participants in the current study, this study shows that difficulty with socio-emotional tasks is not limited to the diagnosis of classic autism. Because these individuals have preference for verbal stimuli and systemizing processes, the current study uses intervention materials such as wordless picture books to bypass these strategies and also to equalize the field for verbal abilities. In addition, the current study replicates findings in the Grossman (2000) study that children with ASD have persistent difficulty with recognition of *fear* in certain contexts.

Hadjikhani, N., Joseph, R.M., Snyder, J., & Tager-Flusberg, H. (2006). Anatomical differences in the mirror neuron system and social cognition network in autism. *Cerebral Cortex*, *16*, 1276-1282. doi: 10.1093/cercor/bhj069

Autism spectrum disorders (ASD) involve neurodevelopmental deficits linked to social and emotional skills. These deficits are especially notable in individuals with ASD through reduced empathy, emotional engagement, and reciprocal social interaction exhibited. The mirror neuron system (MNS) in the premotor cortex has been known to activate with empathy observations. Many studies show functional evidence for the presence of the MNS in humans. The MNS includes the pars opercularis of the inferior frontal gyrus (IFG), adjacent ventral areas, the inferior parietal lobule (IPL) and the superior temporal sulcus (STS). Hadjikhani state that the MNS has been hypothesized to play a large part in imitative learning, which is critical to social-communicative functioning. These processes include “shared representation of perceived and executed action”—a function facilitated by the MNS and the superior parietal lobule. Studies of early development in autism spectrum disorders show deficits in these areas that may be related to dysfunction in the MNS. Some differences have also been cited recognizing a higher ratio of white to gray matter in the brain in individuals with ASD, as well as “gray matter abnormalities” in the inferior frontal, temporal, basal ganglia, amygdala, and cerebellar regions. These differences may contribute to deficits in the emerging “social brain.” To further clarify brain differences in ASD, Hadjikhani et al. recruited 14 high-functioning male young adults with ASD with a group of 14 closely-matched typically developing male young adults. Participants with ASD were diagnosed with a variety of spectrum disorders such as autism, Asperger disorder,

and pervasive developmental disorder not otherwise specified (PDD-NOS). For each participant, two high-resolution structural images were obtained with a 1.5-T Sonata MR scanner. Scans showed that several gray matter areas previously mentioned were “significantly thinner” in the participants with ASD (IFG pars opercularis, IPL, STS). Notably, “thinning” areas included those of facial expression production and recognition (portions of the sensory and motor cortex and middle temporal gyrus) and social cognition areas (prefrontal cortex, anterior cingulate, medial parietal cortex, supramarginal gyrus and middle and inferior temporal cortex). Links were found between ASD symptom severity and level of bilateral cortical thinning in the MNS. These observed abnormalities could be attributed to a number of factors, including 1) defective neuronal proliferation or migration, cell density and microcolumnar changes, 2) secondary consequences of lack of input to specific brain areas resulting either from abnormal subcortical or cortical function, or 3) primary white matter abnormalities. It is important to note that this study is limited to cortical structures and does not examine the amygdala or basal ganglia.

Relevance to current work: The findings provided in this article regarding early deficits in the MNS support the need for social communication intervention for individuals with ASD and similar disorders. This article is cited in the current work to support the pervasive nature of social communication problems within the diagnosis of ASD.

Hadley, P. A., & Rice, M. L. (1991). Conversational responsiveness of speech- and language-impaired preschoolers. *Journal of Speech and Hearing Research*, 34(6), 1308-1317.

In this study, children with typical language ability, “marginal” language ability (second-language learners), language impairment (LI) and speech impairment (SI) were compared to determine differences in responses provided during instances of social interaction. Eighteen students were selected and divided into the four groups above. The participants were observed while interacting with peers during play-center time for six different periods of four minutes. During the play-center time, the children were permitted to choose between a variable of activity areas. Clinicians recorded responses of the children as they engaged in partner interactions. The clinician recorded the choice of play area and the specific partners chosen. Results show that the children in all groups showed similar levels of interaction (as measured by number of conversational turns). However, children with LI and SI interacted more with adults than peers when compared to the other participant groups. In addition, children with LI and SI were more often ignored by conversational partners and less likely to respond to peers’ attempts to initiate conversation.

Relevance to the current work: This study by Hadley and Rice highlights some of the concerning interactional patterns demonstrated by children with language difficulties when interacting with typical peers. These findings support the need for social communication intervention programs which generalize to actual social interaction. As part of the larger project for the current study, researchers investigated a pre-intervention and post-intervention collaborative project involving the participants and typical peers to determine if the quality and quantity of social interaction increased after the program. The common goal of these studies was to support generalization of positive social communication behaviors to functional interactive contexts for the participants.

Harms, M. B., Martin, A., & Wallace, G. L. (2010). Facial emotion recognition in autism spectrum disorders: A review of behavioral and neuroimaging studies. *Neuropsychology Review*, 20(3), 290-322. doi: 10.1007/s11065-010-9138-6

Facial emotion recognition and successful social interaction have an inverse relationship; that is, the ability to recognize facial expression is necessary for social interaction, and social interaction provides the training ground for development of facial emotion recognition (FER). Therefore it is no wonder that individuals with autism spectrum disorders exhibit impairment in emotional intelligence; the channels of development are hindered at both ends. However, the etiology and extent of this impairment is still a topic of intense debate, and many studies report conflicting results. Harms et al. seek to clarify contradictions and make suggestions for future research.

Harms et al. suggest that three factors influence major differences in the results of these studies: demographic characteristics of the participant group, task demands, and dependent variables measured. In addition, the authors note that individuals with ASD may use alternative strategies while exhibiting similar behaviors (achieving similar means) as control-group participants. Age plays a large role in the outcome of FER studies. For example, studies involving adults are more likely to identify impairments in FER because of the complexity of the task. On the other hand, studies with very young participants may mask deficits in ASD because of floor effects. Studies are more likely to include low-functioning younger participants and higher-functioning adults because of the nature of the ASD diagnosis.

Studies with children are particularly affected by group-matching effects, and matching groups according to verbal ability may cause artificially inflated results. Some studies have compensated for these issues by providing two control groups, one matched for verbal ability, and the other matched for non-verbal ability. Other studies involving low-functioning ASD participants have included control groups of various cognitive profiles, such as Down syndrome or intellectual disability. These trials have reported both typical and impaired FER abilities, which findings are most likely dependent on stimulus type (audio-video vs. static expressions, respectively).

Studies with adults report likewise contradicting results. Some studies report typical FER ability in adults with ASD, while others show a continued reduction in FER accuracy, especially with negative emotions. Harms et al. recommend studies with adults should include 1) verbal and non-verbal IQ matched control groups, 2) careful investigation of possible ID etiology in control groups, and 3) longitudinal and cross-sectional studies to investigate the development of FER in ASD. Although many studies with adults report no impairment with basic emotions, high-functioning individuals do reportedly have more difficulty with complex emotions, such as guilt, shame, and envy. In order to reduce ceiling effects in these studies, researchers have implemented techniques such as “morphed stimuli” to detect subtle differences in FER ability, i.e. perceptual sensitivity, which has been found to be correlated with degree of impairment.

Harms et al. also describe some possible compensatory means behind typical FER scores in high-functioning individuals with ASD. It is likely that some of these individuals use more “explicit cognitive or verbally mediated processes” during emotion recognition, instead of the automatic processing used by typically developing controls. Also, the emotion labels in some studies may correspond with formal training received by these individuals in intervention settings; thus some individuals may seem typical when compared to control groups. Alternatively, individuals with ASD may use feature-based processing to decode faces instead of

the more holistic method used by typical controls. Many eye-tracking studies report an increased use of the lower portion of the face in emotion recognition and a “top-down modulation of eye gaze.” These findings have been confirmed by inverse-picture studies showing that individuals with ASD perform better than typical controls when FER pictures are shown upside down.

Relevance to current work: This study provides evidence for deficits in FER for individuals with ASD and speculates as to some reasons behind these deficits. The authors also mention that these individuals are prone to use compensatory strategies as a result of these deficits.

Harris, P. L. (2008). Children’s understanding of emotion. In Lewis, M., Haviland-Jones, J. M., & Feldman Barrett, L.(Eds.), *Handbook of emotions* (3rd ed., pp. 320–331). New York, NY: Guilford Press.

Verbal communication allows humans to communicate what they feel about past, present, and future situations. These interactions provide the basis for the expansion of emotional experience. The author relayed a study showing that children as young as two years old could talk systematically about emotion, referring to both positive and negative states. These children communicated most often about their own feelings, but showed the capacity to talk about the feelings of others as well. The author emphasized that this development of emotion understanding included the recognition of emotions in oneself and the emotions expressed by others.

One hypothesis proposed by Harris is that children develop emotion understanding based on scripts of particular emotions and the typical actions and expressions that accompany them. This ability draws from a significant knowledge of causal connections between sequential events. A limitation of this model is that the same situation can evoke different emotions in different individuals, depending on the reaction of the individual to the specific events. Another limitation of this model is that children with autism are often proficient at remembering sequences of events, but deficient at judging how a person’s beliefs will affect appraisal of a situation. Typically developing children do not exhibit this deficit to the same degree. In order to effectively determine an emotion resulting from a situation, a child must learn to determine if desire, expected outcome, and actual outcome are mismatched.

The development of the appraisal process is illustrated by the ability of older children to surpass younger children in identification of the complex emotion of guilt. While younger children focus mainly on whether the person achieved goals, older children are able to assess whether these achievements conformed to various rules and obligations. Although preschool age children are able to express guilt in certain situations, it is not until middle childhood that children show the ability to make appropriate attributions of guilt, along with other complex mental states, such as surprise.

The author continues with an evaluation of whether emotional understanding contributes to increased social acceptance. From a number of studies investigating this relationship, it was determined difficult to specify a relationship between the two, although they are positively correlated. Finally, the author mentions that frequency of parental discussions of emotion may increase emotion understanding in children.

Relevance to current work: This article provides the definition and framework of the term emotion understanding used in the current work. In addition, several ideas regarding the

development of emotions in children from this article are implemented into the intervention program in the current work. For example, a large emphasis is placed on identifying the character's belief states and the resulting emotions. The "script" for emotion learning in the current study consists of a story enactment that is used repetitively. This article provides evidence for these methods as well as a confirmation of the social difficulty experienced by children with deficits in emotion understanding.

Homer, M., & Rutherford, M. D. (2008). Individuals with autism can categorize facial expressions. *Child Neuropsychology*, 14(5), 419-437.

Homer and Rutherford note that the most serious deficits of autism spectrum disorders (ASD) are in social perception and cognition. In particular, impairments in theory of mind development hinder the understanding of others' mental states, including emotional states. This introduction of this study notes that researchers believe that persons with autism perceive faces with a more explicit and calculating process than typical individuals. Research suggests an "atypical visuospatial strategy" as a perceptual difference—not necessarily impairment—in ASD. Perceptual interpretations both in typical and disordered individuals may include processes of categorization, with distinct category boundaries instead of gradual shifts. This model of perception supports the idea of discrete emotions. An alternate theory is that people perceive faces holistically, by focusing on features as a whole and not on distinct features. Previous studies have suggested that individuals with ASD process faces more systematically, focusing on the mouth in isolation (or a type of "piecemeal" processing) more frequently than the upper regions of the face or the face as a whole. In this study, 15 males with autism (mean age 19.8) were compared to 16 male controls (mean age 19.49). Stimuli included eight sets of morphed-pair photographs, including *happy-sad*, *angry-sad*, *angry-afraid*, *surprised-afraid*, and *angry-disgusted*. Each set was comprised of 11 evenly spaced images ranging from one emotion to the other. Participants engaged in a matching task as well as an identification task to investigate ability to discriminate between subtle differences in photographs. No significant differences were found between the groups in performance, however, the identification curve of happy-sad was much more linear for individuals with autism. All groups showed shorter reaction times for photographs in the peak intervals and longer reaction times for the halfway-point, supporting the categorical model of emotion recognition. Unlike other research studies, this study suggests that individuals with autism spectrum disorders subscribe to the categorical strategy of emotion identification as typical individuals do. These findings also suggest that individuals with autism are also able to process faces in a holistic manner, due to the relatively short presentation time, but may only exhibit this behavior under certain conditions. In other words, these individuals may prefer a systemizing method but adopt another method according to the demands of the task. It is still possible, however, that different social skills training programs, as well as the high-functioning level of the participants, may have had a significant influence on the outcome.

Relevance to current work: This study provides evidence contradicting other studies which argue that individuals with autism are unable to holistically process faces. Homer and Rutherford state that by the late teen and early adult years, these individuals are able to employ a holistic processing method when it is demanded by certain tasks. Intervention programs, such as the one evaluated in the current study, may have had an effect on this ability.

Hopkins, I. M., Gower, M. W., Perez, T. A., Smith, D. S., Amthor, F. R., Wimsatt, F. C., & Biasini, F. J. (2011). Avatar assistant: Improving social skills in students with an ASD through a computer-based intervention. *Journal of Autism and Developmental Disorders*, 41, 1543-1555. doi: 10.1007/s10803-011-1179-z

Individuals with autism spectrum disorders (ASD) have been known to exhibit behaviors that do not facilitate social interaction, such as monopolizing conversations or walking away while others are trying to initiate contact with them. These behaviors could be in part due to limitations in ability to interpret nonverbal communicative acts, such as facial expressions and body language. Emotion recognition is an important component of social interaction that may be impaired in individuals with autism spectrum disorders. When interpreting emotions on faces, persons with ASD tend to rely on the lower region of the face, as well as a systemizing, piecemeal strategy. In order to address these deficits, intervention programs have been implemented that include computer-based programs, with varied results. This study evaluated the efficacy of FaceSay, a realistic avatar-assistant program designed to generalize to real social situations. Forty-nine children with varying levels of functioning participated in the study. All participants had a diagnosis of autism and a mental age between 6 and 10. Researchers obtained measures of cognitive functioning and Childhood Autism Rating Scale scores for all participants prior to the program. Pre- and post-intervention testing also included emotional expression recognition measures using photographs and schematic drawings. The Benton Facial Recognition Test, Social Skills Rating System, and an information social skills observation were also administered before and after training. A control group of 25 children with low or high-functioning autism also participated in these measures, but spent time with art software (Tux Paint) during the intervention sessions. The intervention group participated in a six-week program with FaceSay, playing games and interacting with avatars designed to teach specific social skills. Covered in the program are eye-gaze, joint-attention, holistic face processing, eye-specific emotion recognition lessons. At the end of the program, researchers measured a significant difference in total emotion recognition skills in photographs, but not in drawings-only testing. There was also a significant increase in Benton Facial Recognition Test scores for high-functioning children compared to matched controls, but no change for low-functioning participants on facial recognition measures. However, low-functioning participants did show increased performance on social skills measures, including assertion and self-control. For high-functioning children, there was no reported difference in cooperation, assertion, responsibility, or self-control. When compared to the control group, the high-functioning children exhibited significantly fewer inappropriate social behaviors post-intervention. In general, this study provides some evidence that computer-based programs may improve the social skills of children with autism spectrum disorders.

Relevance to current work: Like the current study, this study by Hopkins et al. evaluates an intervention program designed to facilitate social communication, particularly emotion recognition, in children with ASD. Although this study focuses almost completely on a computer-based program, the objectives and hypotheses of the intervention run parallel to those in the current study. The current study agrees with Hopkins et al. that further research combining intervention programs and neuroimaging studies is needed to better understand the effects of these programs.

Humphreys, K., Minshew, N., Leonard, G. L., & Behrmann, M. (2007). A fine-grained analysis of facial expression processing in high-functioning adults with autism. *Neuropsychologia*, 45(4), 685-695.

Since recent studies have found variable results in facial recognition tasks with individuals with autism spectrum disorder (ASD), more research is needed to clarify the abilities of this population with regard to socio-emotional functioning. Some studies may not be sophisticated enough to reveal subtle deficits, which is the aim of this multi-experiment study.

In experiment 1, 20 high-functioning individuals with autism were compared to 18 IQ-matched controls. 75 morphed facial expressions depicting *anger*, *disgust*, *happiness*, and *sadness* were shown, and participants were asked to decide the prototypical expression of each. Results show that *happiness* was recognized most frequently, and fear least frequently. The only expression recognized less accurately by the autism group was *fear*. There were significant differences overall between the groups in accuracy and reaction time. Measures on the ADOS communication scale showed a relationship between severity of symptoms and ability to recognize *fear* and *disgust*. Common errors included mislabeling *disgust* as *anger* and vice versa, and also mislabeling *fear* as *surprise*.

Experiment 2 consisted of a same/different perceptual task of emotion discrimination. Fourteen participants with ASD (mean age 21) and 18 controls (mean age 29) viewed pairs of images and responded “same” or “different” to the morphed-photograph pairs. Results show no group effects; the adults with autism were just as efficient at discriminating faces as the control group, even if they used a different strategy. Overall results of the two experiments suggest that individuals with ASD perceive emotions in a slightly less categorical manner than typical individuals. In addition, many participants with autism reported that they focused on a particular region of pixels on the face to complete the same/different task, rather than focusing on the face as a whole.

Relevance to current work: This study provides evidence for the unique visual processing methods of individuals with ASD. Researchers note that compensatory strategies allow participants with autism to score in typical range on these tasks—even if the social generalization would not be “typical.”

Izard, C. E. (1992). Basic emotions, relations among emotions, and emotion-cognition relations. *Psychological Review*, 99(3), 561-565. doi:10.1037/0033-295X.99.3.561

Cognitive theories of emotion expression state that emotion experiences are comprised of cognitive components: activating appraisals, subsequent desires, and intentions. Under these theories, emotion results from various subcomponents of cognition. According to one differential emotions theory (DET), cycles of some emotions are consistently present in conscious states; emotions motivate each other in sequence, and cognition is viewed as consequent of, not integral to, the emotion or motivation. Izard argues with researchers Ortony and Turner 1990, stating that emotions such as anger and fear should not be considered “basic” because they are actually not as frequently occurring and referred to as the definition of “basic emotion” would imply. Emotions are termed “basic” because of supposed roles in evolution and biological and social functions. In these roles, emotions are the “basis” for coping strategies and adaptation. All basic emotions under the DET have “innate neural substrates” universally recognized facial expressions, and unique feeling states. However, as inhibition and cognition matures, facial

expressions are no longer “essential features” of specific emotions. Izard discounts further Ortony and Turner research by explaining that any of the components or an emotion itself cannot be called more basic than other components, since the process is a functional system. Izard also explains that emotion can be activated independently of cortical processing or integration (and instead activated by subcortical pathways). Consequently, the DET model proposed by Izard describes an emotion-feeling motivational state independent of cognition. Examples of this non-cognition phenomenon include unconscious motivation, unanticipated pain, manipulation of facial expressions, and changes in cerebral blood temperature.

DET suggests that neural programs are innately prepared for aspects of emotional intelligence such as facial expressions, feelings states, and noncognitive activators of emotion. Other emotion components are learned, or acquired with experience. A combination of this hardwired system and the response adaptability of a preverbal infant brain facilitates communicative and motivational development. DET also includes descriptions of affective-cognitive networks arising from emotion-related experiences. These networks contain “cues” for response action strategies. Generation of “new emotion experiences” furthers the growth of these networks.

Relevance to current work: The DET theory supports the rationale of the intervention program in the current study. Although individuals with autism spectrum disorders may have impaired systems that are innately prepared for emotional intelligence, the intervention program is designed to facilitate compensatory strategies, providing “new emotion experiences” to strengthen pathways associated with emotion identification and facial expression recognition. The conversation on basic emotions is also considered in the current study for division of emotional categories.

Johnson-Laird, P. N. (1989). The language of emotions: An analysis of a semantic field. *Cognition and Emotion*, 3(2), 81-123.

This study proposes and examines a theory of emotion grouping. Emotions are dependent on series of internal events used to label arousal caused by external events. Words to label this process may include elements of the sequence of emotional arousal: eliciting condition, cognitive evaluation, physiological activation, change of action readiness, and action. The primary purpose of the study was to determine if a semantic division of emotions is plausible.

Components of the theory are as follows: 1) Emotions serve at least two communicative functions, both within the brain and within the social group. The emotion represents a non-propositional signal associated with a particular physiological pattern. 2) The evaluation of emotional state can be performed at any level in the hierarchy of cognitive processing. 3) Bodily sensations (such as hunger) are distinct from emotion, which has psychological causes originating from cognitive evaluations. However, basic emotions sometimes have corresponding bodily sensations, e.g. a racing pulse along with fear. 4) A set of complex emotions depends on self-awareness of etiological causes, e.g. embarrassment, jealousy, and regret.

Johnson-Laird proposed to test three specific theoretical statements: 1) Emotion terminology should be analyzable into coherent categories, 2) All terms denoting emotions ultimately depend on just the five basic families of emotion modes: happiness, sadness, anger, fear, and disgust, and 3) Words referring to emotions will reflect the structure of emotional experience as posited by the theory. Words representing emotions are claimed to fall into seven

categories: generic emotions, basic emotions, emotional relations, caused emotions, causatives, emotional goals, and complex emotions. Johnson-Laird includes a corpus of 590 emotional words and their corresponding semantic and categorical analyses.

Relevance to current work: The current study relies on the proposed theory that emotion-based words can be divided semantically into distinct categories. The current study uses parallel categories: *happiness, sadness, anger, fear, and disgust*, but adds *surprise*. Emotion-based words are categorized in the current study with some reference to the corpus of emotional Words.

Jones C. R., Pickles, A., Falcaro, M., Marsden, A. J., Happe', F., Scott, S. K., ... Charman, T. (2011). A multimodal approach to emotion recognition ability in autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, 52(3). doi: 10.1111/j.1469-7610.2010.02328.x.

In order to understand the social processing of individuals with autism spectrum disorder, research has examined their ability to identify and understand basic emotions, such as happiness, sadness, fear, anger, surprise, and disgust. Some studies report an impairment in recognizing one or more basic emotions, while others report that individuals with autism scored similarly to typical controls. These results may be due to the differences in sample size between studies or the methodological design. In addition, emotion recognition as it applies to real-life situations is a dynamic, ongoing process which includes both visual and auditory ability. This study examined 99 adolescents (mean age 15;6) in a facial emotion recognition task, a verbal emotion recognition task, and a non-verbal vocal emotion recognition task. The group with ASD was compared to 57 adolescents with no ASD, matched for age and IQ. The data were analyzed using a structural equation model, with minimal influence from IQ and weighted least squares mean and variance adjustments (WLSMV). Results show that the non-group with ASD confused surprise most with disgust on the identification tasks, and the group with ASD confused surprise most with happiness. In general, however, this study shows no evidence of a "fundamental impairment" in the recognition of basic emotions in adolescents with ASD. Researchers mention that since this study does not include a developmental component, it may not account for early childhood deficits and consequent adoption of compensatory strategies.

In addition, researchers provide an interesting discussion on possible reasons for a 'surprise' deficit in children with ASD. Since the emotion 'surprise' is largely cognitive, cannot be categorized as exclusively positive or negative, and is not entirely focused on affect, low-functioning children may experience difficulty with the mental mapping of 'surprise.' In addition, parents and caregivers may realize that these children function best under routine conditions and therefore limit exposure to the concept of surprise. Overall, Jones et al. suggest that emotion recognition should not be considered in isolation or as the sole cause of social and communication impairments of children with autism spectrum disorders.

Relevance to current work: This study implies that children with ASD may have an impairment with the emotion of 'surprise,' in part due to environmental factors. Therefore, the current study hypothesizes that a conscious targeting of 'surprise' in a variety of contexts will facilitate a better understanding of that emotional category.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology*

and *Psychiatry*, 47, 611-620. doi: 10.1111/j.1469-7610.2005.01567.x

Two developmental concepts children with autism often struggle to develop are joint attention and symbolic play. Although these behaviors are highly documented with autism, they are not often targets of intervention. Theoretical and empirical research shows that these behaviors contribute to better understanding of others and more efficient social, cognitive, and language abilities. This study included 65 children with autism randomized into three treatment conditions: joint attention, symbolic play, and control group. Prior to participation in the intervention, children were assessed for early social communication, structured play, and caregiver-child interaction. Treatment goals were written for each child based upon skills that were emerging but not yet mastered in the categories of joint attention and play. Each child received daily treatment for 30 minutes. Treatment approach included applied behavior analysis (ABA) and facilitative interactive methods. Prompting, reinforcement, behavioral drill, and milieu teaching were implemented into therapy plans.

Results showed that compared to the control group, the play group and joint attention groups showed improvement in initiation. Although the play group improved significantly more than the control group, all groups improving in functional and symbolic play. Gains made in both treatment groups were significant, contributing to efficacy of the treatment. The children also showed generalization of the treatment skills to caregiver play sessions.

Relevance to current work: This study shows evidence for the efficacy of social communication intervention for children with autism at a high level of evidence (randomized control trial). The current study targets later-developing concepts of emotional intelligence, but with the similar objective of improving social communication behavior which is hindered in development.

Kjelgaard, M. M., & Tager-Flusberg, H., (2001). An investigation of language impairment in autism: Implications for genetic subgroups. *Language and Cognitive Processes* 16(2/3), 287-308. doi: 10.1080/01690960042000058

Traditionally, the diagnosis of autism is based on abnormalities in the areas of social interaction, communication, and repertoire of activity interests present before age 3. Language difficulties are often an early marker for autism diagnosis, although they vary widely within the diagnostic population. Communicative deficits a universal component of the diagnosis. On the other hand, language functioning in autism is highly variable. The objective of this study was to examine the language profiles of a well-defined sample of children with autism, including an investigation of phonological representation and production, lexical knowledge, semantics, and grammar. The research questions addressed by this study were as follows: 1) What is the relationship between expressive and receptive abilities among children with autism? 2) What is the profile of language ability across measures of phonology, vocabulary, and higher order language skills? 3) How can we best characterize the heterogeneity of language abilities among children with autism? 4) Do children with autism who have impaired language skills resemble the profile of language disability that is found among children with SLI?

This study included 89 children diagnosed with autism between the ages of four and fourteen. The sample included 80 boys and nine girls. The children participated in a testing battery including the *Goldman-Fristoe Test of Articulation*, *Peabody Picture Vocabulary Test-III*

(*PPVT-III*), *Expressive Vocabulary Test (EVT)*, *Clinical Evaluation of Language Fundamentals (CELF)*, and *Repetition of Nonsense Words*. Results revealed that the majority of participants (80% of the sample) did not exhibit a difference of more than one standard deviation between scores on the *PPVT-III* and *EVT*. However, children with higher-level abilities who completed the *CELF* showed higher expressive than receptive abilities, although a wide level of variability was noted in this regard. Based on the results of the *CELF*, the children were divided into three profile groups: normal language, borderline language, and impaired language. Scores on the *Goldman-Fristoe Test* were noted to be within typical range for all groups. A significant relationship was observed between IQ and language ability of the participants. Many children were unable to reach a basal on basic language tests, supposedly due to a difficulty understanding the demands of the task.

The researchers note that a subgroup of children with autism evaluated in this study was characterized by language difficulties parallel to the deficits observed in SLI. Based on these observations, the researchers argue that although SLI by definition cannot be diagnosed in children with autism, there may be overlap between the two disorders, at least with some individuals with language-related deficits concurrently with autism symptoms. In addition, evidence from genetic studies suggests that the two disorders may involve one or more shared genes, although further research is needed to narrow the genetic overlap between the two disorders.

Relevance to current work: Kjelgaard and Tager-Flusberg provide evidence that the language abilities of individuals with autism are heterogeneous. However, in this study these authors identify a subgroup of individuals with autism which have language deficits similar to those seen in a profile of SLI. These authors use these observations to build evidence for a hypothesized overlap between the two disorders. Although this is a fairly recent hypothesis, its validity has significant effects in intervention design. The participants in the current study were recruited on the basis of shared deficits between the disorders of autism and LI, particularly in the area of social communication. Although these two disorders are typically seen as distinct for research purposes, the common social communication difficulties observed in these participants led to joint inclusion in the current intervention program.

Klecan-Aker, J. S. (1993). A treatment programme for improving story-telling ability: A case study. *Child Language Teaching and Therapy*, 9(2), 105-115.

This study was designed to evaluate the efficacy of an intervention program aimed to improve the story-telling ability of a single child participant with language impairment (LI) and learning disability (LD). The child was male and age 8;8 at the time of the study and attended a second grade class for children with learning or language difficulties who did not qualify for special education placement. Prior to the intervention, the clinician elicited two oral and written stories from the participant for a baseline evaluation of story-telling skills. On a criterion-referenced assessment, the participant scored at a Level 2 for story-telling ability. The participant attended two intervention sessions per week for twelve weeks. Each intervention session lasted one hour. Intervention targets were drawn from Level 3, Level 4, and Level 5 story-grammar components in succession. At the conclusion of each level, the clinician elicited two spontaneous stories, one week apart, for evaluation. At the end of the treatment, the participant produced Level 5 stories independently. Follow-up testing for language was also administered. Post-intervention, the participant did not change in receptive or expressive language based on

standardized testing, but a slight improvement was noted in reading comprehension. Parents and teachers observed that the participant used the learned skills in other settings, supporting the possibility of generalization of intervention objectives.

Relevance to current work: The Klecan-Aker study used a story-telling context as a basis for social communication intervention. The current study also uses a story-telling context, but with the added component of story enactment and different treatment objectives. However, the Klecan-Aker study provides evidence for the efficacy of such a context for improvement of social communication outcomes and increased generalization of target abilities.

LaCava, P., Rankin, A., Mahlios, E., Cook, K., & Simpson, R. (2010). A single case design evaluation of a software and tutor intervention addressing emotion recognition and social interaction in four boys with ASD. *Autism, 14*, 161-178. doi:10.1177/1362361310362085

Children with autism (or ASD) are known to have difficulty in the cognitive skill of theory of mind. Some researchers have characterized children with autism as having a “systemizing” mind rather than an “empathizing” mind in the area of social interaction and relationship development. One component of theory of mind is recognition of the emotions of others. Differences in emotion recognition have been noted in individuals with ASD from childhood to adulthood. The purpose of this study was to investigate whether a computer program, *Mind Reading*, could assist students with autism in improving emotion recognition and social interaction skills. Four boys between the ages of seven and ten years old participated in this study. These students received help for academic, behavioral, and social deficits. Participants were evaluated for emotional concept recognition in six “basic” categories of emotion: *happy, sad, angry, afraid, disgusted, and surprised*, and nine complex mental states: *loving, embarrassed, undecided, unfriendly, bothered, nervous, disappointed, amused, and jealous*. Emotion recognition was tested with black and white pictures, color pictures, and black and white cartoon faces. Positive social interaction was measured through observation of interaction with peers.

The Mind-Reading software implemented in the intervention program in this study included several teaching components. In the Emotions Library, users can interact with emotions in thematic groups with video clips, voice recordings, images, and stories. A Learning Center includes lessons and quizzes for each emotion. The Games Zone involves interactive games such as selecting the emotion expressed on a partially covered face. *Mind Reading* has six levels of difficulty based on developmental growth. The software was implemented into a multiple-baseline across-participants experimental design with the four participants. Each participant used *Mind Reading* for 7-10 weeks, with an average time of 12.3 hours total spent with the program. An adult tutor assisted the participants during each software session. Results indicated that all participants improved in emotion recognition scores from pre- to post-treatment testing in areas of basic and complex emotion. Parents agreed that the children improved in emotion recognition in socially important contexts. For three of the four participants, parents agreed that social interaction with peers increased. Researchers noted that improvements were made even in participants who required full-day school support during the school day, indicating that the software had potential to contribute to gains even in low-functioning individuals when adult support was present.

Relevance to current work: This study evaluated the efficacy of the *Mind Reading* software program used with young children with autism in improving emotion recognition in basic and complex categories. The sample size in this study was small, but it was found that all children demonstrated some degree of improvement post-treatment. *Mind Reading* software is incorporated into the intervention evaluated in the current study, although it is not the main focus. It was observed in the current study that participants generally responded positively to the software. Gains made from the software program could not be separated from other methods in the current intervention program, but studies such as this from LaCava and colleagues provide evidence for the efficacy of this type of treatment.

Law Smith, M. J., Montagne, B., Perrett, D. I., Gill, M., & Gallagher, L. (2010). Detecting subtle facial emotion recognition deficits in high-functioning autism using dynamic stimuli of varying intensities. *Neuropsychologia*, 48(9), 2777-2781.

Facial expressions are a key component of social interaction. Many studies have evaluated the ability of individuals with autism spectrum disorders to recognize facial expressions of emotion, but relatively few have investigated the effect of testing with varying levels of stimuli. Studies using “full-blown” stimuli may miss subtle differences in abilities in high-functioning individuals. Law Smith et al. propose to reduce “ceiling-effect” testing by introducing “dynamic stimuli of varying intensities.” Law Smith and colleagues use six basic universal emotions identified by Ekman: *happiness, sadness, fear, anger, disgust, and surprise*. The Law Smith study used an Emotion Recognition Task with a clinical sample of 21 males 12-19 years of age diagnosed with high-functioning autism or Asperger’s syndrome. A control group of 16 typically developing males ages 12-18 also participated in the study. Stimuli were presented using video clips of morphed images (to create varying “levels” of expression). After four practice trials, data was recorded for 24 video clips in the actual task. Results were analyzed to investigate the effect of confounding variables. Researchers found a significant positive correlation between *disgust* accuracy and age. ANCOVA analysis showed significant main effects of age and emotion; Bonferroni corrected post hoc pairwise comparisons revealed a higher performance on *happy* than the other emotions, and *fear* with lowest level of performance. Participants with HFASD performed significantly lower than controls on *anger, disgust, and surprise*, while *fear, happiness, and sadness* were even across groups. In particular, participants in the HFASD group were significantly less accurate at 100% intensity on *disgust* than controls. No other group differences appeared at 100% intensity. Overall results showed participants with HFASD as less accurate at recognize emotion expressions of *anger, disgust, and surprise* at low intensities in comparison to controls.

Relevance to current work: The Law Smith et al. study and the current study use the same six basic emotions listed by Ekman. Although the Law Smith et al. study involves participants of higher age than the current study, the speculation is that social communication intervention at a younger age will improve scores on later measures. The intervention in the current program takes this research into account and targets *anger* and *surprise* specifically in lesson plans.

Liiva, C. A., & Cleave, P. L. (2005). Roles of initiation and responsiveness in access and participation for children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 48*, 868-883. doi: 10.1044/1092-4388(2005/060)

In this study, researchers aimed to investigate the success, style, and duration of attempts to access peer interactions made by children with specific language impairment (SLI). Participants included 69 first and second grade students grouped into 23 triads. Each triad included a target child from a group of ten children identified with SLI and 13 identified typically developing controls. The typically developing children and remaining children in the triads had no academic, behavioral, or communication difficulties. During the trials, the two play partners were invited to play with toys in an examination room. After ten minutes elapsed, the target child was led into the room and introduced to the play partners. The examiner remained in the room, but in a separate area, to observe the access of the target children to the ongoing interaction. The target child was observed for a period of ten minutes. The examiners transcribed the utterances produced by each child for the sessions and determined the length of time required for the target child to access the interaction. The target child was considered as participating in the interaction when a turn in play was taken (verbal or nonverbal) and at least one play partner responded to this turn in the following utterance or action. Further behaviors from this point were categorized as group play, individual play, or onlooking behavior.

Results of this study show that all but one of the typically developing target children accessed the conversation. Nine of these children required less than one minute to access the interaction. Of the target children with SLI, six achieved access to the interaction, and four never achieved access. Two children who achieved access required more than three minutes to do so. As a whole, the children with SLI accessed the conversation by responding to initiation requests made by play partners, instead of attempting to initiate interaction. After access was granted, children with SLI carried less conversational weight than typically developing peers. Performance comparison with standardized testing revealed that higher expressive language scores correlated with quicker interaction access.

Relevance to current work: This study showed some of the social communication deficits experienced by children with LI and the effects of these deficits in peer interactions. Reduced ability to access peer interaction and deficient interactional ability after access are both deficits that can be addressed with social communication intervention. Although these skills are not explicit targets of the intervention program in the current study, the information from this study contributes to the need for improved social communication interventions targeting a variety of abilities.

Losh, M., & Capps, L. (2006). Understanding of emotional experience in autism: Insights from the personal accounts of high-functioning children with autism. *Developmental Psychology, 42*(5), 809-818. doi:10.1037/0012-1649.42.5.809

The diagnosis of autism is marked by qualitative impairments in social interaction and communication as well as restricted/repetitive behaviors and interests. Included in the definition of social communication is the ability to build and maintain affective connections with others. Contrary to past reports stating that individuals with autism do not recognize or express emotion, many recent studies have found surprising competency with basic emotions such as happiness,

sadness, and anger. However, high-functioning individuals may still experience difficulty with complex or self-conscious emotions that do not have distinct facial expressions. A large part of understanding these complex and self-conscious emotions depends on reflection and evaluation in relation to sociocultural norms and expectations—processes that may be impaired in individuals with ASD. Previous collections of personal accounts report that children with ASD require more time, prompts, and scripting to discuss complex emotion than comparison groups. These findings contribute to the speculation that individuals with ASD employ computational approaches—drawing on their cognitive resources—to respond to socio-emotional stimuli. Losh and Capps further explored the emotional experiences of fifty participants using a discourse method. They analyzed thematic content and discourse form to determine strategies used by participants. Participants ranged in age from 7-13 years. 28 were diagnosed with high-functioning autism and 22 were typically developing comparison children. Children were given lists of emotion words (including simple, complex, and controls) and asked to define each and share a personal experience regarding that emotion. Content was scored 1-3 on the basis of explanation and clarification ability. Form was examined by counting the number of causes (verb plus arguments) in each account. Narrative use was also recorded. Losh and Capps used 2 x 4 ANOVAs to test for differences across different experiences. Results show that participants with ASD were not incapable of using emotion-based words appropriately, but often failed to provide sufficient details needed to distinguish the emotion from others in same valence type. With regards to form, account length did not differ between groups in any category. Overall, participants with ASD shared fewer personal narratives and required more prompting before doing so. In some categories children with ASD performed similarly to typical controls, but were less likely to include “explanations of causal origin” when describing self-conscious emotion-based words. Narratives from children with ASD included fewer specific time frames, cast of participants, causal/consequential elements, and subjective meaning. Specific responses suggest that some descriptions of emotions were formed from rote expectation instead of personal experience. Interestingly, the responses of children in the group with ASD were more likely to include components of facial expression than personal narratives when compared to controls.

Relevance to current work: Findings from this research are incorporated into the design of the intervention program in the current study. The intervention in the current study focuses heavily on causal relationships between events and emotion (i.e. why does the boy feel sad?), especially with picture-book discussions. Also, the concept of personal narratives are elicited in the intervention with journaling (i.e. can you tell me a time when you felt surprised?) to further understanding of emotion. The tendency for individuals with ASD to use compensatory strategies when faced with emotion-based tasks evidenced by this study is incorporate in the Introduction of the current study.

Loveland, K. A., Tunalikotoski, B., Richard, C. Y., Ortegon, J., Pearson, D. A., Brelsford, K. A., & Gibbs, M. C. (1997). Emotion recognition in autism: Verbal and nonverbal information. *Development and Psychopathology*, 9(3), 579-593.

Of the symptoms manifest with autism spectrum disorders (ASD), impairment in the recognition and expression of emotion is one of the more apparent and impactful. This impairment may stem from general inability to monitor and react to other’s internal states. One problem with research studies investigating emotion recognition is that their stimuli might not be

representative of real social situations, e.g. simple facial expression recognition tasks lack the multiple social channels (verbal, gestures, bodily posture, etc.) present in a real interaction. Often information from these channels conflicts in a single expression of emotion, so listeners must use even more sophisticated levels of emotional intelligence to filter out which channel is most applicable. Individuals with ASD may experience difficulty with this “multi-tasking” aspect of emotion recognition.

Loveland et al. agree with other researchers that emotions caused by beliefs (surprise, embarrassment) may be the more difficult for persons with ASD to identify. Also, low and high-functioning individuals may have differential abilities in recognizing “cognitive emotions” versus simple emotions. To take these factors into account, Loveland et al. recruited both low-functioning and high-functioning individuals in groups by age (children, adolescents, and young adults). One low-functioning group of participants included 15 individuals with Down syndrome and 3 with intellectual impairment of unknown etiology. The procedure included viewing 24 brief video clips, prior to which the participants were told an emotion the people would be experiencing. Afterward, the participants were asked to report the emotions of the person in the video. Stimuli were designed to provide verbal, non-verbal, or combination information on emotional state. In addition, emotions were presented either animated (clearly identifiable) or flat (face and voice neutral), and either explicit (emotion word stated) or implicit (emotion only implied). Correct responses on these tasks were analyzed using repeated measures ANCOVA. No differences were found between the high-functioning group with ASD and high-functioning control group, and likewise with the low-functioning group with ASD and the low-functioning control group. This finding suggests that ability to recognize and express emotion is more dependent upon developmental level than diagnosis. Loveland et al. also state that these results may be due to “qualitative differences related to affective understanding between HF and LF groups that are not captured by ‘developmental level’ alone.” Additionally, *surprise* items were found to yield significantly more errors than other stimuli across groups. Low-functioning individuals made more significantly more errors with implicit than explicit categories, which suggests that individuals in high-functioning groups employed some “cognitive strategy” to interpret emotion. Loveland et al. make the overall conclusion that abilities regarding emotion recognition in individuals with ASD are more comparable to individuals of similar developmental level, instead of similar diagnosis.

Relevance to current work: Loveland et al.’s results from dynamic stimuli are applicable to the design of the current study’s intervention program. The current study uses *surprise* as a key target for emotion recognition and mentions in the Discussion that gains made in this area are significant because of underlying cognitive elements in this emotion category.

McGovern, C. W., & Sigman, M. (2005). Continuity and change from early childhood to adolescence in autism. *Journal of Child Psychology and Psychiatry*, 46, 401-408. doi: 111/j.1469-7610.2004.00361.x

McGovern and Sigman sought to evaluate the developmental trajectory of individuals with autism based on a moderate sized sample of participants in a longitudinal study. The participants were evaluated in early childhood, mid-school years, and late adolescence. Information was drawn from parental reports, behavioral observations, and assessments. The

researchers investigated diagnosis, symptoms, adaptive functioning, and emotional responsiveness.

Diagnostic symptoms were observed using the Childhood Autism Rating Scale (CARS). Although scores decreased on the CARS and DSM-III criteria from early childhood to early adolescence in a group of 76 subjects with autism, all subjects in the study continued to receive a diagnosis of autism. Based on these data, participants were expected to show moderate improvements in symptoms but maintain criteria for inclusion in the study. Forty-eight participants remained in the subject group for the duration of the study. Results of this study show that improvements were made in the developmental trajectory in areas such as general symptoms, adaptive behavior, and behavioral responsiveness to emotions of others. However, the authors note that the diagnosis maintained strong stability longitudinally, meaning that regardless of improvements, participants continued to meet diagnostic criteria into adolescence and young adulthood. In particular, parents reports fewer repetitive behaviors and stereotyped interests in adolescence than in middle childhood. Adaptive behavior was reported to improve in all areas except for communication skills. Improvements significantly corresponded to the IQ level of the participant. Based on these findings, the authors advocate for interventions based on cognitive and communication skills early in life for children with autism. One significant limitation of this longitudinal study was the inability to obtain detailed information regarding the participants' home, school, and intervention experiences. However, the outcomes observed provide evidence for the pervasive nature of autism symptoms and behaviors and the need for efficient and early intervention.

Relevance to current work: McGovern and Sigman provide evidence that social communication difficulties in children with autism are pervasive into adolescence and adulthood. These authors support the need for early intervention targeting these behaviors. The current study evaluates an intervention program designed to improve social communication in a distinct area, emotional intelligence.

Merrison, S., & Merrison, A. J. (2005). Repair in speech and language therapy interaction: Investigating pragmatic language impairment of children. *Child Language Teaching and Therapy*, 21(2), 191-211. doi: 10.1191/0265659005ct288oa

This study was designed to investigate the conversational repair skills of school-age children with pragmatic language impairment (PLI), specific language impairment (SLI) and typically developing children. Nine children were divided evenly into these three groups. The participants with PLI and SLI participated in a part-time language unit and speech and language therapy. Participants took part in individual interactions with a clinician based around referential communication tasks. The children were required to draw a route on a map based on instructions from the clinician. The script followed by the clinician included six instances of inadequate instruction geared to elicit conversational repair strategies from the participants. Following a baseline attempt at this task, intervention was instigated. Children in the group with PLI received therapy targeting repair strategies once per week for six weeks. Children in the group with SLI received intervention targeting language structure once per week for six weeks. The participants then engaged in a follow-up task similar to the baseline task. Responses were recorded and analyzed according to the specific type of inadequacy in the clinician's script. Results showed that children in the typical group and the group with SLI initiated repair more frequently than the children in the group with PLI. Children in the typically developing group best replicated the

target map, showing improvement from pre- to post-intervention period, although they did not participate in intervention. It was supposed that this effect was due to familiarization with the assessment task. Although the children in the group with SLI initiated repair more than any other group, there was no significant improvement between their pre- and post-intervention map scores. Following the intervention period, the children in the group with PLI showed a significant increase in repair initiation, suggesting that the pragmatic intervention yielded a positive effect on conversational repair skills.

Relevance to current work: This study highlighted one social communication skill, conversational repair, which has the potential to improve as a result of specific intervention. Studies such as this support the notion that social communication interventions with specific targets have positive outcomes for children with pragmatic impairments. The current study draws from a parallel objective.

Morton, J. E. (2001). Children's understanding of emotion in speech. *Child Development*, 72(3), 834-843.

Morton claims that communication of emotion exists in two channels: propositional content and paralinguistic. Propositional content is composed of words and phrases, and paralinguistic includes everything outside the words that conveys affect, including prosody and speech rate. Paralinguistic cues may be either intentional or resultant of the speaker's arousal. Occasionally, propositional content and paralinguistic cues deliver contradicting information, and listeners must selectively interpret which category includes the relevant cue. Morton suggests that adults consider all available cues, while children process/do not process a variety of cues depending on age and experience. This study investigates the effect of age on interpretation of speaker affect. Participants listened to the same sentence presented with happy and sad paralinguistic and indicated the emotion of the speaker. In the case that cues conflicted (e.g. a sad situation related with happy paralinguistic), children were more likely to indicate emotion based on content, while adults relied more heavily on paralinguistic.

Relevance to current work: Children's ability to understand and apply concepts of emotion continues to develop through adulthood. This study indicates that typical children may misinterpret emotion because of a tendency to favor semantic content of an utterance. In cases where typical children would misinterpret emotion, children with social communication difficulty are even more likely to show ineptitude due to a variety of factors discussed previously. Combined with other studies, this study confirms the importance of prosody in the decoding of emotion in conversation and indicates one reason children with language disorders may struggle with concepts of emotion.

Pernon, E. A. (2007). Autism: Tactile perception and emotion. *Journal of Intellectual Disability Research*, 51(8), 580-587.

Individuals with autism spectrum disorders have been recorded to have occasional strong emotional reactions to sensory stimuli. Pernon seeks to investigate these tactile-affective connections. Thirty participants formed a group diagnosed with infantile autism with mean age 7;11 and developmental age 2;11. A control group was comprised of children with

communication disorders, affective disorders, hyperkinetic disorders, intellectual disability, or Down syndrome. A third group consisted of 30 children with no diagnosis of intellectual disability matched to the group with ASD for gender and developmental age. Stimulus experiences were videotaped and coded for pleasant versus unpleasant emotional states. Behaviors were coded that included facial movements, tonic movements, motor behaviors, and increased exploration time. In the first experiment, three cubes were used as stimuli: one with plastic spikes, one with satin, and one painted wooden cube for the control. These cubes were moved along the participants' left and right hands for five seconds, and then left on the table for one minute. No significant differences in response were found between the three groups. In the second experiment, three cushions of different temperature were used. The warmed cushion yielded a greater intensity of facial expressions from children with ASD than control groups. For a third experiment, air stimulation from a fan was imposed on the face for twenty seconds, and then switched off for a similar time period for control measures. Then, two fans (one on, one off) were placed within reach of the child. Responses were measured for 1) moving closer to the fan, and 2) moving closer, then away from the fan. Participants with autism exhibited more of these two behaviors than participants with other diagnoses or those in the control group. Pernon views these results in the context of a "need for sensation or even as an emotional dependency [on stimulation]," and also an indication of "how easily their emotional centre can be unbalanced." However, these results must be taken with caution because of the tendency for children with autism to exhibit particular facial expressions and motor patterns.

Relevance to the current work: Pernon provides some insight into the pattern of emotional development for children with autism spectrum disorders. According to this research, children may link emotional states to particular tactile stimuli, and seek repeated contact with positive stimuli. Pernon's research emphasizes the need to balance the emotional centers of the brain (by controlling for distracting stimuli) in order to maintain a teaching environment. In the current research study, stimulation from tactile objects such as the fishing pole (repetitive spinning) may have had an effect on the participants' reactions to the overall program.

Piggot, J., Kwon, H., Mobbs, D., Blasey, C., Lotspeich, L., Menon, V., ... Rice, A. L. (2004). Emotional attribution in high-functioning individuals with autistic spectrum disorder: A functional imaging study. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43(4), 473-480. doi: 10.1097/01.chi.0000111363.94169.37

The authors of this study sought to determine whether increased ability to attribute emotion to basic facial expressions in individuals with high-functioning autism spectrum disorder (ASD) was supported by amygdala, fusiform, and prefrontal regions of interest (ROI). The authors note that although high-functioning individuals with ASD have higher intelligence levels, they show significant difficulties with social understanding. Although these individuals are able to identify basic facial expressions, social cognition deficits contribute to reduced ability to attribute more subtle facial expressions or expressions in social situations. In typical individuals, the fusiform has been identified as the area of facial processing and identification of emotion from basic expressions. Individuals with ASD have been observed to show reduced fusiform activation when viewing and processing facial stimuli, and instead activate feature-based processing areas.

Fourteen high-functioning males with ASD and ten control subjects participated in this study. Participants viewed faces in random order for five seconds each in groups of six photographs. Accuracy and response time were acquired for two identification of emotion tasks, while a control task measured matching of shapes. Functional MRI scans were obtained. Results show that the ASD group performed more poorly on one of the tasks, and required a longer response time. However, individuals in both groups showed similar activation of amygdala and pre-frontal regions during emotion identification. Authors speculated that the individuals with ASD are able to activate these areas when it is explicitly required by the task, and therefore have task-dependent identification expertise. In summary, high-functioning individuals with ASD may be able to identify emotions in specific tasks, but experience difficulty in genuine social situations with the same processing. The authors state that social skills interventions should explicitly teach individuals with ASD to attribute emotion to facial expressions when more than one is present at once, as well as implement information from the whole face, rather than single characteristics. Speed and accuracy should also be addressed, as these elements are essential for proficiency in social situations.

Relevance to current work: This study is cited in the Introduction of the current work. Piggot and colleagues provide evidence that typical neural areas for facial processing can be activated during structured emotion identification tasks. The authors of this study also explain the need for social communication interventions that explicitly teach emotion identification, such as the intervention in the current study. Some additional guidelines mentioned by Piggot et al. are included in the current intervention. Specifically, the participants in the current study are often required to identify emotions on pages of the story when several characters show different emotional expressions in the same scene.

Richardson, K., & Klecan-Aker, J. S. (2000). Teaching pragmatics to language-learning disabled children: A treatment outcome study. *Child Language and Teaching Therapy*, 16, 23-42. doi:10.1177/026565900001600103

The authors of this study sought to determine whether an intervention targeting pragmatic skills, particularly in the areas of conversation, internal responses, and qualitative and quantitative descriptions of objects could improve the pragmatic abilities of children with language learning disabilities (LLD). Twenty students, ages 6;5 to 9;8 participated in this study. Each participant attended a private school for children with learning disabilities. Baseline measures were obtained using a criterion-referenced test that measured social skills and language use. Baseline data signified that three areas were deficit in the participant group: conversational ability, internal responses, and description of objects. These areas were set as the intervention objectives. The participants then received class therapy sessions in groups of nine or eleven students each for thirty-minute sessions over a period of six weeks. The treatment session time was divided evenly between the three goal areas. To target conversation, clinicians taught a four-part conversational framework including a greeting, statement or question, topic maintenance, and farewell statement. To address internal response, the class navigated examples of seven basic emotions: *happy*, *sad*, *mad*, *frustrated*, *surprised*, *embarrassed*, and *bored*. The children were required to identify these emotions when given pictures of faces. To target object description, the children were taught to describe name, label, color, shape, size, function, and material of everyday objects. The participants were given criterion-referenced testing following the treatment sessions. Results of this testing indicate that both classes of participants demonstrated

improvements in the three areas targeted in treatment. In addition, some areas not specifically targeted in intervention showed improvement post-intervention. The researchers note that the regular classroom teachers' instruction, if related to the therapy targets, may have affected the outcome of the testing.

Relevance to current work: This study gives evidence that pragmatic abilities can show improvement after intervention targeting specific behaviors in this area. Like the current study, a portion of this study was dedicated to the teaching and evaluation of the children's ability to identify basic emotions. This study shows that improvement can be made in this area after a period of treatment.

Rogers, S. J. (2000). Interventions that facilitate socialization in children with autism. *Journal of Autism and Developmental Disorders*, 30, 399-409.

A core element of the diagnosis of autism is social dysfunction. This deficit is cited as the most handicapping feature of the diagnosis. Therefore, improving social functioning in individuals with autism has been argued to be the most important intervention target for these individuals. Researchers have designed and implemented a variety of social interventions with individuals with autism to determine the efficacy of different treatment methods. This article analyzes a basis of literature regarding the efficacy of social intervention for these children. The author reports that children with autism have been documented to respond well to not just one method of intervention, but a variety of different interventions with the objective of increasing the quantity and quality of social engagement with others. Both individualized and peer-inclusion interventions have been shown to be successful. In addition, participation in these social interventions has been shown to positively affect other areas of development, including language, even when these behaviors are not the main targets of the interventions. Taken in combination, research studies provide evidence that although social behaviors are severely affected in individuals with autism, intervention designed to improve these behaviors can have a positive effect. For that reason, the author argues that research evaluating social intervention for these children is a critical research need.

Relevance to current work: This study evaluates a broad base of literature regarding social intervention for children with autism. The author concludes that since social intervention has been shown to increase the quality and quantity of positive social behavior, further research in this area is greatly needed. The current study aims to identify whether an intervention targeting one specific area of social communication, emotional intelligence, will improve after a period of treatment.

Rudie, J. D., Shehzad, Z., Hernandez, L. M., Colich, N. L., Bookheimer, S. Y., Iacoboni, M., & Dapretto, M. (2011). Reduced functional integration and segregation of distributed neural systems underlying social and emotional information processing in autism spectrum disorders. *Cerebral Cortex*, 22(5), 1025-1037.

Rudie et al. support findings stating that etiologies of social and emotional deficits in autism spectrum disorders (ASD) are due in part to altered communication between brain regions. The authors label this difference "reduced functional integration and reduced segregation of large-scale brain networks." In the study, twenty-three children with ASD were compared to a

control group of twenty-five matched peers. The subjects viewed emotional face expressions while a functional MRI (fMRI) measured brain activity, particularly in areas previously associated with emotion deficits—the bilateral amygdala and inferior frontal gyrus. Results show reduced functional integration and long-range connectivity in the amygdala. The same phenomena were observed in the parietal cortex, with increased integration of the right frontal cortex. This is reportedly the first study to link both decreased long-range connectivity and reduced functional segregation and serves to explain previous disagreements in research regarding increased and decreased connectivity.

The authors mention that reduced functional integration and segregation may reflect “immature or delayed connectivity” rather than altered connectivity due to ASD and compensatory mechanisms. These speculations are under further research.

Relevance to current work: Rudie et al. acknowledge the need for clinical relevance; the authors state that the characterization of functional brain networks in individuals who may be at risk for ASD might possibly be used for early diagnosis and development of intervention plans. This article emphasizes the connection between the neurobiological background of ASD and the development and investigation of intervention programs.

Salovey, P., Detweiler-Bedell, B. T., Detweiler-Bedell, J. B., & Mayer, J. D. (2008). Emotional intelligence. In M. Lewis, J. M. Haviland-Jones, & L. Feldman Barrett (Eds.), *Handbook of Emotions* (3rd ed., pp. 533-547). New York, NY: Guilford Press.

These authors argue that “emotional intelligence,” or the perception, understanding, regulation, and utilization of emotions contributes to the well-being and growth of an individual. People construct experiences based on thoughts, feelings, and behaviors, which construction is considered part of “social intelligence.” Emotional intelligence is an essential component of social intelligence, because social issues are often focused around affective information. Some authors have stated that a person’s internal concept is characterized by emotional experiences. Contemporary psychology has shifted away from the “disruptive” nature of emotions and toward the functionality of emotions. Today it is widely accepted in psychology that emotion augments other cognitive capacities.

The authors build a definition of emotional intelligence as including the following: “The ability to perceive and express emotions, to understand and use them, and to manage emotions so as to foster personal growth.” Emotional intelligence is more specifically defined as including distinct competencies: “The ability to perceive emotion accurately, the ability to access and generate feelings when they facilitate cognition, the ability to understand affect-laden information and make use of emotional knowledge, and the ability to manage or regulate emotions in oneself and others to promote emotional and intellectual growth and well-being.” These four areas are expounded and described in a unique model presented by the authors. They emphasize that future research should focus on the development of tasks to assess emotion-related skills.

Relevance to current work: The current study draws from the definition of emotional intelligence included in this study, as an intervention designed to improve the emotional intelligence of participants is evaluated. However, as this article describes, emotional intelligence is a many-faceted subcategory of social intelligence, and therefore is difficult to assess and

quantify. The current study focuses on the accurate use of emotion words as an indicator of increased emotional intelligence.

Spackman, M. P., Fujiki, M., Brinton, B., Nelson, D., & Allen, J. (2005). The ability of children with language impairment to recognize emotion conveyed by facial expression and music. *Communication Disorders Quarterly*, 26(3), 131-143.

This study was designed to examine the emotion understanding of children with language impairment (LI) in two contexts: labeling facial expressions and labeling emotions expressed in musical selections. Forty-three children with LI between the ages of five and twelve participated in this study. Forty-three gender and age matched children participated as a control group. During the first portion of the study, the children were presented with twenty-four photographs of facial expressions depicting *happiness, sadness, anger, fear, disgust, or surprise*. The children answered with the corresponding emotion using response cards representing each option, as well as an additional card representing "I don't know." The children could also respond with a verbal label. Each of the six emotions was presented four times in the group of photographs. During the second portion of the study, the children used the same response cards to identify emotions from 20-second musical passages. Choices for identifying the emotions in the musical passages were limited to *happiness, sadness, fear, anger*, and "I don't know."

Results of the first portion of the study indicate that children in both groups performed similarly for emotions of *happiness, anger, sadness, and fear*, but the children with LI performed more poorly on emotions of *disgust and surprise*. Overall, depictions of *happiness, anger, and sadness* yielded more accurate responses than the other emotion categories. Results of the second portion of the study were analyzed according to the proportion of responses for a selection that were in agreement. The typically developing children and older children with LI demonstrated higher level of agreement. Musical selections most commonly identified as *happy* produced higher agreement rates than *anger, fear, and sadness*. *Anger and fear* were commonly confused in this task by children from both participant groups. Children with LI often misidentified *anger* selections as *fear*. These differences in response may support the notion that children with LI recognize emotions differently compared to typically developing peers.

Relevance to current work: This study provided support for the assumption that children with LI struggle with emotion understanding. Specifically, these children show difficulty identifying *fear, surprise, and disgust*. A similar trend was observed with emotion identification in the current study. Although children showed some modest gains in the intervention context, often these emotions did not generalize to post-treatment testing.

Swanson, L., Fey, M. E., Mills, C. E., & Hood, L. S. (2005). Use of narrative-based language intervention with children who have specific language impairment. *American Journal of Speech-Language Pathology*, 14, 131-143. doi: 10.1044/1058-0360(2005/014)

This study evaluated the practicality and efficacy of implementing a narrative-based language intervention with school age children with specific language impairment (SLI). Ten students, age 6;11 to 8;9 participated in this study. Formal language assessment scores for each participant were at least 1.5 *SD* below the mean, while IQ, hearing, socioemotional, and neurological functioning were proved to be typical. Participants were, for the most part, involved

in speech and language services in school settings. Intervention was initiated to address deficits in oral narrative sharing. The primary goal of intervention was to increase the use of complex grammatical forms while relaying narratives. Additional goals were included based upon individualized narrative and conversational deficits. Intervention sessions focused on listening to clinician-presented versions of narratives with exaggerated examples of target forms, followed by participant retelling of the story with required support. Intervention also included sentence imitation tasks, story generation tasks, and repeated retellings. The narrative samples were scored using the DSS module of Computerized Profiling and transcribed with a SALT program. Results indicated that eight of the ten participants improved in quality of narrative telling. One participant increased the number of different words used during narrative telling. Developmental sentence scores did not show significant changes, and sentence imitation scores improved only slightly. Researchers concluded that although gains were modest, participants' post-treatment scores were approximately equal to estimated scores for typically developing children, suggesting that this narrative-based language intervention could be a valid treatment component for children with LI.

Relevance to current work: This study illustrated how children with LI often struggle with the linguistic and structural components of narrative retelling. Although this deficit was not explicitly examined in the current study, the intervention program in the current study was largely focused on a narrative retelling and story enactment context. Challenges exhibited by children with LI and broader social communication difficulties in this area could have affected their ability to acquire the intervention targets (emotion words) within this context, and therefore affected the results of the current study.

Tager-Flusberg, H. (2006). Defining language phenotypes in autism. *Clinical Neuroscience Research*, 6, 219-224. doi:10.1016/j.cnr.2006.06.007

A diagnosis of autism spectrum disorder (ASD) does not specify a level of language ability. Individuals with this diagnosis exhibit a wide variability of language skills. Some researchers have divided individuals with ASD into two categories, those with typical linguistic abilities, and those with impaired language. The second subgroup has been compared to children with specific language impairment (SLI), and the language phenotypes have been argued to be similar. This article investigated two studies based around this hypothesis.

Study 1: The purpose of this study was to determine the types and extent of errors made by children with autism and concurrent language impairment on standardized tests of non-word repetition. A group of 35 children with ASD participated in this study. The children were administered a test battery which included non-word repetition tasks. Results indicated that 15 children in the group scored within typical or borderline typical range, while 20 children exhibited significantly lower scores. Comparison to other test scores yielded the finding that performance on the non-word repetition task was linked to expressive fluency and expressive vocabulary knowledge. Error analyses of the non-word repetition task revealed that phoneme substitution errors were the most common, but deletion errors were more common among participants with concurrent language impairment.

Study 2: In this study, 29 children with autism (20 with language impairments based on standardized testing, and 9 without language impairments) were compared to 13 children with SLI for the use of grammatical morphology in conversational speech. Speech samples were obtained for participant-parent and examiner-child interactions. Percentage of appropriate use in

obligatory context was calculated for verb and control-noun related morphemes. All participants showed high accuracy for noun morphemes and past-tense verb morphemes, but for the participants with SLI and autism with concurrent language impairment, performance on third person present tense was significantly lower.

A combined view of these studies supports the notion that a subgroup of autism exists in which language deficits are similar to those observed in SLI. In addition, both groups show linguistic deficits which transfer to pragmatic contexts, including narrative production and comprehension and general communicative areas.

Relevance to current work: This study provides support for the combination-diagnosis participant group recruited for the current study. The participant group in the current study was examined on the basis of shared features of social communication deficit. This study describes the overlap between language deficits in these two disorders which carries over to pragmatic contexts.

Thompson, R. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development*, 59(2-3), 25-52.

Thompson expands on the idea of emotion dynamics, or variations in the intensity, persistence, modulation, onset and rise time, range, lability, and recovery from emotional responses. Emotion dynamics are influenced by emotion regulation ability. Emotion regulation is relevant to social strategies, cognitive performance, and management of experience. In order to be successful, emotional responses must be flexible according to situation. Emotional competence is enhanced by encounters in social context based upon emotion culture. Individual differences in personality and social functioning affect the development of these attributes. By examining these concepts of theoretical emotion development, Thompson lays the foundation for the research question of this article: How should we define *emotion regulation*? The following definition is proposed: "Emotion regulation consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals." Thompson supports each component of this definition and distinguishes this concept from other emotion process models.

The author also answers the question: What is regulated in *emotion regulation*? Neurophysiological constituents, attention processes, construals of emotionally arousing events, encoding of internal emotion cues, access to coping resources, regulating emotional demands of familiar settings, and selecting adaptive response alternatives are all pathways of emotion regulation. Competent emotion regulation can involve any or a combination of these processes. The heterogeneous nature of emotion regulation among individuals cautions against the construction of a homogenous emotion regulation process. Emotion regulation is deeply integrated into social relationships due to social expectations and the demands and support provided in social contexts. Emotion regulation strategies can significantly affect the development of social relationships. Individual differences in the development of emotion regulation contribute to the complexity of devising such strategies.

Relevance to current work: The definition of emotion regulation proposed in this article is implemented into a discussion of subcomponents of emotional intelligence in the current work. This article also provides evidence for the complex nature of emotion regulation and effects of deficits in this area on social situations. Children with impaired emotional intelligence

experience difficulty with social communication. In the current work, some instances of failed emotion regulation in participants may have contributed to reduced access to the intervention targets.

Timler, G. R., Olswang, L. B., & Coggins, T. E. (2005). Social communication interventions for preschoolers: Targeting peer interactions during play group entry and cooperative play. *Seminars in Speech and Language, 26*, 170-180. doi: 10.1055/s-2005-917122

Timler and colleagues note that preschoolers with language impairment (LI) are less effective in their approach and management of peer interaction. This article discusses social communication behaviors in typically developing preschoolers and those with language impairment, as well as intervention strategies for developing communication skills in the context of peer entry and cooperative play situations. The authors explain that typically developing children use a combination of verbal and nonverbal behaviors to gain entry to a group. They will often use negotiative statements while navigating cooperative play. Children with LI may show difficulty during cooperative play responding to the questions and comments of peers and make fewer comments about the ongoing activity. The authors note that because of this disparity, social communication interventions for children with LI must address both maintenance of interactions and development of the communicative behaviors necessary to support these interactions.

Timler and colleagues provide a number of essential features for a successful social communication intervention program, including the following: classroom modifications, teacher-implemented instructions, and explicit individualized social communication training. Practice with peers is also an ideal component of these interventions. Direct instruction, modeling, rehearsal with peers within play contexts, and informative feedback assist with generalization of the learned behaviors to the classroom. The authors conclude by stating that addressing peer interaction problems is crucial to later mental health and adjustment throughout life, and therefore social communication interventions are “clinically sound” approaches for improving functional communication.

Relevance to current work: This study explains some of the challenges experienced by children with social communication impairment and the effects that impairment can have on activities in the classroom and throughout the children’s interactions with others. The article provides sound support for the implementation of social communication intervention programs. The program in the current study is focused primarily on “explicit individualized social communication training,” as mentioned above, although some peer interactions and teacher input are also present in the larger study.

Tomblin, B. (2011). Co-morbidity of autism and SLI: Kinds, kin and complexity. *International Journal of Communication Disorders, 46*(2), 127-137. doi: 0.1111/j.1460-6984.2011.00017.x

Frequently, features thought to be characteristic of specific language impairment (SLI) are also present in other neurodevelopmental disorders. According to Tomblin, the profile for SLI shows bias in the clinical service system because of the disparity of diagnoses used for clinical and research purposes. Specifically, there exists a large group of children with autism

spectrum disorders (ASD) who have language difficulties. Children with SLI and ASD overlap in regards to poor spoken communication skills. From some perspectives, these two disorders could be completely different conditions, but from others, they could be more closely related.

In this article, the author navigates the current diagnostic requirements for SLI and ASD and some differing opinions within these topics. For example, by definition, persons with SLI cannot concurrently be diagnosed with ASD, but persons with ASD may be also diagnosed with SLI, and demonstrate co-morbidity of the two disorders. There is research-based evidence that a subgroup of ASD exists whose members have language-learning disorders, which is shown by standardized testing, brain imaging, and familial patterns. Tomblin also mentions articles and studies which question the idea of co-morbidity, stating that although some surface-level manifestations are similar, the underlying bases are different. Three reasons for children with ASD demonstrating poor structural language are then proposed: a) these two disorders may share some common etiology, based on brain mechanisms and genetic differences, b) direct interactions experienced by children with ASD have significant effects on their language development, and c) a child with high-language ability would be considered as having Asperger syndrome instead of ASD, which automatically means reduced language levels for those in the category of ASD.

Relevance to current work: This study was cited as support for the overlap between ASD and LI and therefore the structure of the participant group in the current work. The participants in the current work were selected on the basis of social communication difficulty, instead of on common base diagnosis.

Wallace, G. L., Case, L. K., Harms, M. B., Silvers, J. A., Kenworthy, L., & Martin, A. (2011). Diminished sensitivity to sad facial expressions in high functioning autism spectrum disorders is associated with symptomatology and adaptive functioning. *Journal of Autism and Developmental Disorders*, 41(11), 1475-1486.

Undoubtedly, diagnoses of autism spectrum disorders (ASD) are related to difficulties identifying and processing emotional information. These abilities are commonly assessed by facial emotion recognition (FER) tasks. Although children with ASD have been found to exhibit difficulty with FER tasks, results may be confounded with IQ or developmental age and are therefore tricky to claim as specific to ASD. Some studies report no deficits in identifying basic emotional expressions, but others report difficulty with emotions of negative valence (fear, disgust, sadness, and anger). Wallace et al. acknowledge that many of these FER studies do not include stimuli representative of the “constantly changing expressions encountered in real-world interactions.” To account for this deficiency, the current study uses a twenty-step multimorph stimulus from neutral to full expression. This method distinguishes between small differences in functioning between individuals of varying ability. Thirty-one typically developing adolescents were compared to 42 high-functioning adolescent with ASD in this study. The experimental stimuli included 21 photo images increasing in 5% increments from a neutral to fully expressive face. Two different faces for each of six emotions were shown for three seconds each, for a total of 12 trials. Participants were asked to identify the emotion as soon as they were sure of an answer (no haphazard guessing). Scoring included accuracy of identifying expressions and sensitivity to subtle differences (noting which number in the series yielded the correct identification). Results show that FER accuracy and perceptual sensitivity were not significantly

correlated with each other in either the ASD or the control group. Typical controls were more accurate in identification of four of the six emotions and exhibited greater perceptual sensitivity than participants with ASD. Of all the emotions tested, perceptual sensitivity to “sadness” yielded the most significant difference between the two groups. Further analysis revealed association between diminished sensitivity to “sadness” and lower adaptive functioning and social communication scores. A confusion matrix showed that across all participants, the most common confusion errors were: 1) labeling sadness as anger or fear, and 2) labeling disgust as anger. Wallace et al. speculate that these findings contribute to the supposed impairment in “emotional empathy” in individuals with ASD.

Relevance to current work: The findings of this study confirm the need for intervention programs targeting emotional intelligence in individuals with social communication disorders. In particular, the intervention program in the current study seeks to assist in the development of “emotional empathy” mentioned by Wallace et al.

Weng, S. S. (2011). Neural activation to emotional faces in adolescents with autism spectrum disorders. *Journal of Child Psychology & Psychiatry*, 52(3), 296-305.

Research has indicated that autism spectrum disorders (ASD) involve a general deficit in the ability to recognize emotion in facial expressions. In this study, twenty-two adolescents with ASD were compared to twenty typically developing peers to investigate the differences in brain activation during 250 ms presentations of various facial expressions. Of the participants with ASD, six were diagnosed with autism, three with Asperger’s syndrome and thirteen with PDD-NOS. The participants were tracked with a functional MRI and required to indicate the gender of the face to ensure attention. Results show that both groups responded to the gender question with similar timing and accuracy, but individuals with ASD presented with more bilateral activation in certain socio-emotional structures, such as the amygdala, vPFC and striatum. Younger adolescents showed more pronounced amygdala activation than older adolescents. This phenomenon occurred most with “sad” facial expressions. The results were not associated with participant depression, anxiety, or medications. Weng provides two possible explanations for the results of this study: 1) Facial expressions are more ambiguous for those with ASD because of patterns of early development, and this higher ambiguity engages the amygdala, ventral prefrontal cortex (vPFC) and striatum, and 2) Facial expressions may be more distressing for individuals with ASD and that distress might drive higher activation.

According to the article, research studies have disagreed about amygdala activation and ASD. At least four studies have documented increased amygdala activation with ASD. Other studies reported lower activation relative to control groups. Weng speculates that group differences in attention contribute most to this divide. Consequently, the current study neutralizes that difference by requiring the behavioral response (identifying gender by pressing a button).

Relevance to current work: This study contributes to the speculated neurological differences in the interpretation of emotion in individuals with ASD. As a whole, this research documents the need for efficacious intervention programs that specifically target emotional intelligence.

Wright, B., Clarke, N., Jordan, J., Young, A. W., Clarke, P., Miles, J., ... Williams, C. (2008). Emotion recognition in faces and the use of visual context in young people with high-functioning autism spectrum disorders. *Autism*, 12(6), 607-626. doi: 10.1177/1362361308097118

Recent theories regarding autism spectrum disorders (ASD) describe impairment in terms of failing to understand aspects of sensory stimuli dependent on emotion understanding. Wright et al. note that the differences in type of control group used impact the outcome of studies of emotion recognition and expression. This notion is supported by the replicated finding that controlling for age-equivalent verbal ability equalizes differences in emotion recognition performance. Wright et al. also support the notion that theory of mind impairments may contribute to difficulty with emotions requiring previous knowledge or expectations (e.g. surprise, fear). In addition, the authors discuss the heightened ability of children with ASD to identify embedded figures under the Kanner theory of "attention to constituent parts." This theory suggests that individuals with ASD are more likely to employ segmentation strategies when interpreting facial expressions or solving other emotion-related tasks.

The method of this study includes 35 individuals with ASD between the ages of 7 and 16 and 35 typically developing controls, matched for age and verbal-IQ. Each participant viewed 60 Ekman faces depicting six different facial expressions and labeled the expressions from those six provided descriptions. In addition, participants labeled emotions and contextual information from photographs displaying distinct situation-dependent facial expressions. Lastly, participants were asked to describe the occupation of characters in photographs as a control task for context. Regression analysis of the results showed that IQ was a better predictor than age for scores on the emotion recognition task. Diagnosis was only significant in "happiness" and "anger" responses. No significant differences for context tasks were found when data were controlled for age, sex, and IQ score. Wright et al. speculate that these findings could be attributed to the high-functioning level of participants (many were diagnosed with Asperger syndrome) or the unlimited time given to respond to stimuli. A final observation from this study is that individuals with ASD imitated emotion expressions before giving a label, a behavior not observed in any control participants.

Relevance to current work: Wright and colleagues investigated emotion recognition in children with ASD and discovered that in high-functioning ASD, IQ was a significant predictor in outcome. These authors also found that the participants were apt to imitate emotion expressions while labeling them, a behavior also noted in the current study.

Appendix B

Production and Target Match Percentage and Valence Accuracy by Participant

Participant E.F.

Session Number	Production and Target Match Percentage (Overall Accuracy)		Valence Accuracy		Percentage of Errors with Incorrect Valence
B1	9/18	50%	16/18	89%	22%
B2	12/18	67%	17/18	94%	17%
B3	11/18	61%	17/18	94%	14%
1	18/22	81%	19/22	86%	75%
2	13/15	87%	15/15	100%	
3	8/9	89%	9/9	100%	
4	18/19	95%	19/19	100%	
5	22/22	100%	22/22	100%	
6	8/8	100%	8/8	100%	
7	11/13	85%	13/13	100%	
8	14/17	82%	17/17	100%	
9	3/3	100%	3/3	100%	
10	25/27	93%	26/27	96%	50%
11	12/12	100%	12/12	100%	
12	19/19	100%	19/19	100%	
13	11/12	92%	11/12	92%	100%
14	28/30	93%	30/30	100%	
15	23/24	96%	24/24	100%	
16	10/11	91%	10/11	92%	100%
17	25/25	100%	25/25	100%	
18	29/33	88%	33/33	100%	
19	13/13	100%	13/13	100%	
20	7/7	100%	7/7	100%	
F1	13/18	72%	18/18	100%	
F2	13/18	72%	18/18	100%	
F3	12/18	67%	18/18	100%	

Participant M.P.

Session Number	Production and Target Match Percentage (Overall Accuracy)		Valence Accuracy		Percentage of Errors with Incorrect Valence
B1	9/18	50%	18/18	100%	
B2	8/18	44%	16/18	89%	22%
B3	7/18	39%	15/18	83%	27%
B4	9/18	50%	18/18	100%	
1	18/20	90%	19/20	95%	50%
2	20/21	95%	21/21	100%	
3	8/8	100%	8/8	100%	
4	3/3	100%	3/3	100%	
5	14/23	61%	22/23	96%	11%
6	11/11	100%	11/11	100%	
7	12/13	92%	12/13	92%	100%
8	7/7	100%	7/7	100%	
9	6/7	86%	7/7	100%	
10	1/1	100%	1/1	100%	
11	5/7	71%	6/7	86%	50%
12	11/13	85%	12/13	92%	50%
13	14/17	82%	17/17	100%	
14	6/7	86%	7/7	100%	
15	12/12	100%	12/12	100%	
16	2/2	100%	2/2	100%	
17	21/22	95%	21/22	95%	100%
18	14/16	88%	14/16	88%	100%
19	23/23	100%	23/23	100%	
20	16/17	94%	16/17	94%	100%
F1	11/18	61%	16/18	89%	29%
F2	12/18	67%	17/18	94%	17%
F3	12/18	67%	17/18	94%	17%

Participant B.J.

Session Number	Production and Target Match Percentage (Overall Accuracy)		Valence Accuracy		Percentage of Total Errors with Incorrect Valence
B1	8/18	45%	16/18	89%	20%
B2	8/18	45%	14/18	78%	40%
B3	7/18	39%	14/18	78%	36%
B4	8/18	45%	14/18	78%	40%
B5	9/18	50%	15/18	83%	33%
1	28/30	93%	30/30	100%	
2	13/15	87%	15/15	100%	
3	8/9	89%	9/9	100%	
4	18/19	95%	19/19	100%	
5	22/22	100%	22/22	100%	
6	8/8	100%	8/8	100%	
7	11/13	85%	13/13	100%	
8	14/17	82%	17/17	100%	
9	3/3	100%	3/3	100%	
10	25/27	93%	26/27	96%	50%
11	12/12	100%	12/12	100%	
12	19/19	100%	19/19	100%	
13	11/12	92%	11/12	92%	100%
14	28/30	93%	30/30	100%	
15	23/24	96%	24/24	100%	
16	10/11	91%	10/11	91%	100%
17	25/25	100%	25/25	100%	
18	29/33	88%	33/33	100%	
19	13/13	100%	13/13	100%	
F1	12/18	67%	16/18	89%	33%
F3	12/18	67%	16/18	89%	33%
F4	12/18	67%	17/18	94%	17%

Appendix C

Emotion Word Coding Manual

Participant Initials:

Session Number and Date:

Length of Video:

Examiner:

Emotion -Based Word	Category of Emotional State	Category in Error	Production and Target Match	Time of Production	Type of Production	Correct Valence vs. Incorrect Valence	Specificity	Over- extended

Guidelines for Each Coding Category

Emotion-Based Word – Write (verbatim) the emotion word as it is produced by the participants

Category of Emotional State – Group each emotion word into the category that is most closely synonymous to its actual meaning (e.g., *mad* will be grouped under *anger*; *excited* will be placed under *happiness*, etc.). Emotional categories will coincide with those defined by Dunn et al. (1987):

Happiness (H): like, love, happy, enjoy

Surprise (Su): surprise, surprised

Anger (A): mad, angry

Fear (F): afraid, frightened

Disgust (D): used to describe feelings toward sensory feelings, smell, taste, sight, etc. “I hate the sandwich.”, smelly, yucky

Contempt (C): used to describe general feelings of dislike towards a person, laughing at someone, “I hate the boy.”

Sadness (Sa): unhappy, sad, miserable

Category in Error – The production is considered correct if it is the same word (or a form of the same word) that the clinician is attempting to elicit. Spontaneous productions that are contextually appropriate are also considered accurate. Productions that are not the same as the word the clinician attempted to elicit are considered inaccurate and record the intended category of emotion state. For example, if the clinician was attempting to elicit *sad* but the child said happy, the category in error was *sad*.

Production and Target Match – Compare the child produced emotion word category and the target category. If they match, the production is counted as correct. If they do not match, the production is counted as incorrect. For example, if the child produces a word in the *happiness* category and the target word category was *happiness*, it would be counted as correct. But if the child produces a word in the *sadness* category but the target word category was *happiness*, it would be counted as incorrect.

+ = Correct (production and target word match)

- = Incorrect (production and target word do not match)

Time of Production – Write the exact time in the clip that the emotion word is produced (e.g., 18:42).

Type of Production – Write the amount of support that is required in order to elicit each emotion word produced:

Spontaneous (S): The participant produces the emotion word without any modeling or cueing from the clinician.

Cued (C): Emotion words produced after phonological cues (e.g., the clinician says “/s/” in order to elicit “sad”), semantic (e.g., “He fell in the water, he is not smiling, he looks ___.”) or gestural/visual cues (e.g., pointing to a frowny face) are coded as cued productions.

Question (Q): The clinician asks the child what emotion is being portrayed or how a character is feeling. The child produces the emotion word following the question (e.g., “How is the boy feeling?”)

Repetition/Imitation (R): The clinician produces an emotion word and within the next five seconds, the child repeats it (or a simplified form of it). If either the clinician or child produce other verbalizations before the child repeats the word, it is not counted as a repetition.

Correct Valence vs. Incorrect Valence – Valence is considered correct if the word produced is of the same tone as the intended word. Words produced of a different tone as the intended word are considered to have incorrect valence (e.g., saying “happy” instead of “sad” is incorrect valence because the two have opposite tones; saying “mad” instead of “sad” is correct valence because the two have similar tones).

+ = Correct valence
- = Incorrect valence

Specificity – Specificity is determined by calculating the proportion of emotion words that were accurate or correct within the context in which they were produced.

+ = Correct
- = Incorrect

Overextended – Any emotion word that is overextended to multiple category situations will be noted. If the child says ‘happy’ for every situation requiring an emotion word, ‘happy’ is considered overextended. If the emotion word produced by the child is not being overextended, than this column may be left blank.

Special Coding Considerations

Code the following:

- Specific names for emotions (e.g., sadness, happiness, anger, etc.)
- Adjective forms of emotion words (e.g., excited, scared, annoyed, etc.)
- The verbs *like*, *love* and *hate*
- Words describing facial expressions associated with specific emotions (e.g., “She feels *frowny*” Or “That’s a *scary* face”)
- Verb forms of emotion words that are produced in a way to elicit emotion (e.g., to excite, to surprise, to frighten, etc.)

Do not code the following:

- Adjectives describing actions or appearances (e.g., funny, cute, silly, weird, etc.)
- Expletives and interjections (e.g., Whoa! Hey! Dang it, etc.)

If the child reads the emotion-based word aloud or asks “How do you spell (emotion word)”, the production is not coded.

If the child produces the same emotion word multiple times in succession, the number of emotion words coded will depend on the situation. If the child is repeating the same word but in response to different contexts, continue to code each repetition (e.g., “sad” turn page “sad”). However, if the child is repeating the emotion word in regards to the same context, code only the first repetition (e.g., while looking at the same page, “sad, sad, sad, sad.” If the emotion word produced is the repetition of the clinician’s production, valence does not need to be coded.

For productions such as “not (emotion word) or “don’t (emotion word)” (e.g., “I’m not happy” or “I don’t like oranges”), judge the emotional category based on the context of each individual utterance.

For questions about what should or should not be considered an emotion-based word and which emotional category each word belongs to, refer to the appendix of emotion words compiled by Johnson-Laird and Oatley (1989).

Appendix D

Sample Lesson Plan

Obtained from Cornett (2012)

RESPONSIVENESS LESSON PLAN 8 (lesson 2 F OHO)

Student Name: _____ Date: _____

Target Areas: 1) understanding facial expression 2) labeling emotion 3) inferring emotions that situations elicit 4) understanding differing emotions 5) responsiveness in interaction

Objective	Activities	Materials
1. Facial expression Labeling emotion Inferring emotion	Story and journal review from last session	Book: A Frog on His Own
1. Facial expression Labeling emotion Inferring emotion	<p>Play the story Emphasize frog's motives. He wants to go off on his own for a while. He wants to join play or interaction with others but he disrupts play (conversation) instead. Emphasize his intentions (Does he mean to sink the boat?) Model complex sentence forms</p> <p>Using the book, make dialog bubbles showing what characters want and how they feel in scenarios. Tell the story and read the bubbles with the child. For bubbles, use written words and line drawing of emotion.</p> <p>Use Mind Reading videos to explore emotions and reactions to events</p>	<p>Book" Frog on His Own</p> <p>Frog, dog, turtle, cat</p> <p>Paper, crayons, pictures</p> <p>Mind reading</p>
2. Understanding differing emotions Inferring emotions	Role play with child a real life scenario reading the emotions of others while entering play and while maintaining play. Example, a boy likes to play with blocks. How might he feel if we ask him to play blocks?	Props as needed
3. Journaling-all appropriate target areas for the activities	Highlight what we learned today. Highlight re: anticipating effects of actions on others	Crayons and markers, journal,

COMMENTS:

Subjective: Presents subjective information/impressions; background information

Objective: Presents objective information obtained from the session(s)

Script for Objective 1:

Introduce A Frog on His Own

1. Page one: Reintroduce characters—where are they going? What do you think they are planning?
2. Page two: Look at what the boy is doing, where is he looking? What is he interested in? How about the dog? The turtle? What is the frog doing? Who knows sees him jumping out? (the turtle)
3. Page three: What does the boy do? Who goes with him? What is the frog doing? (waving goodbye). What do you think the frog wants to do? What is he planning? How would he feel to be alone? How would you feel?
4. Page four: Where is the frog? How does he feel? What do you think he might do?
5. Page five: What is the frog doing? (Wow! He has a long tongue! He is sticking it out. That surprised me!) Why is he doing that?
6. Page six: What does the frog have? Why did he catch the bug? What is he going to do with that bug? Do you think the frog likes to eat bugs? Would you like to eat a bug? Different people like different foods. Give some examples. Review previous lunch bag activity.
7. Page seven: Look at the frog. How does he feel? (surprised—maybe a little scared). What has happened? What happened to that bug?...
8. Page eight: The bug is a big hornet (bee). The bug is flying away. How did the bee get out of the frog's mouth? What did the bee do to the frog? How does the frog feel? Did you every eat anything that hurt your tongue? How did you feel?
9. Page nine: Something different is happening in this picture. Look at these people. What are they doing? Why is the lady sitting on the ground? What are they going to do? Oh wait, where is that frog? Can you see him? He is hiding. He is watching the man and the lady. How does he feel? What would he like to do? (Join the picnic). I wonder what the frog will do. Can you guess?
10. Page ten: What are the man and the lady doing? Where is the frog? Oh wow-what is he doing? Why does he want to be in the basket? Do the man and lady know the frog is in the basket? What could happen? How will the man and lady feel if the frog eats the lunch? How will the man and lady feel if the frog jumps out?
11. page eleven: What is the lady doing? Where is her hand? What could happen here? Where is the frog's hand? Does she know there is a frog in the basket? How will she feel if she sees that frog? What will she do?

12. Page twelve: What happened? What is the frog doing? How does the frog feel? Does he like the lady? What would he like to do? (Have lunch with the lady?) How does the lady feel? How does the man feel? How would you feel if you found a frog in your lunch? What will happen now?
13. Page thirteen: Oh, look what happened. What did the frog do? What is the lady doing? How does she feel? What is the man doing? How does he feel? (Highlight the fact that the lady is mad and the man thinks it's funny. They feel different things.) How does the frog feel? Where do you think he is going?
14. Page fourteen & fifteen: Where is the frog now? What can he see? What do you think he would like to do? (play with the boy) Look at this boy. What is he doing? How does he feel? Who else is in this picture? Who do you think that lady is? (Probably his mom)
15. Page sixteen: What is the frog doing? Where does he want to be? What does he want to do (ride in the boat?) How does he feel? Look at this boy. What does he see? How does he feel? (surprised)
16. Page seventeen: What did the frog do? Does the boy see the frog? How does the boy feel? What do you think he is thinking?
17. Page eighteen: What happened to the boat? How did that happen? Did the frog mean to sink the boat? What is the boy doing? How does he feel? What is his Mom doing? How does she feel about it? What about the frog? How do you think he feels? What is he doing? (getting away)
18. Page nineteen: Now where is the frog? What can he see? What is the lady doing? What do you think is in the carriage (buggy/stroller)?
19. Page twenty: What is the lady doing? Look at the cat? How does the cat feel? What is the frog doing? What does the frog want to do? (play with the baby?) What do you think will happen?
20. Page twenty-one: What is the lady doing (getting a bottle out of her bag). Who is in the carriage? How does the baby feel? How does the frog feel? What does the frog want? (play with the baby) Does the mother know that the frog is in the buggy/carriage/stroller? What about the cat? What can the cat see?
21. Page twenty-two: What is the mother trying to do? (Feed the baby.) What is going to happen? (The frog will drink from the bottle). Does the mother know the frog is going to drink from the bottle? How does the baby feel? Why? (mad because the frog is going to drink his bottle) What is the cat doing? What do you think will happen?
22. Page twenty-three: What happened? What does the mother see? How does she feel? What is the frog doing? What does the frog want? (the bottle) How does the frog feel? What is the cat doing? How about the baby? How does the baby feel? What do you think will happen?

23. Page twenty-four & twenty-five: What happened? (The buggy tipped over—maybe the baby fell out) How does the baby feel? What is the mother doing (trying to make the baby feel better)? What is the cat doing? How does the cat feel? What is the frog doing? How does he feel? Did the frog want to make the baby fall? What do you think will happen?
24. Page twenty-six: What is the cat doing? How does the cat feel? What is the frog doing? How does the frog feel? What do you think the cat wants to do to the frog?
25. Page: twenty-seven: What has happened? What was the cat planning to do? How does the frog feel? Look at the cat's face? How does the cat feel now? (scared) Why do you think the cat feels scared? Where is the cat looking? What do you think the cat sees?
26. Page twenty-eight & twenty-nine: What is happening? Who did the cat see? (turn page back to 27 and then to 28. (the dot, boy, and turtle). How does the cat feel? (scared) What was the cat scared of? (the dog). What is the dog doing? (scaring the cat away) What is the boy doing? How does the boy feel? Why? How does the frog feel? Why? (He is safe now—his friends saved him from the cat).
27. Page thirty: Who do you see on this page? What are they doing? (going home?) How does the frog feel? Why? Review what the frog did on his own. How did things work out for him? Did he get to play with anyone? Why not? Discuss what the boy knows about the frog's day. What do the dog and turtle know about the frog's day. (They only saw the cat encounter).